THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. APRIL 23, 1896. CHICAGO, ILL. NUMBER 17.

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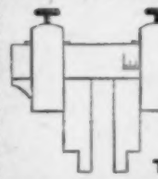
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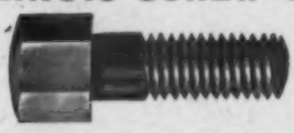
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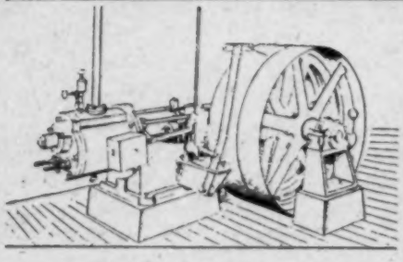

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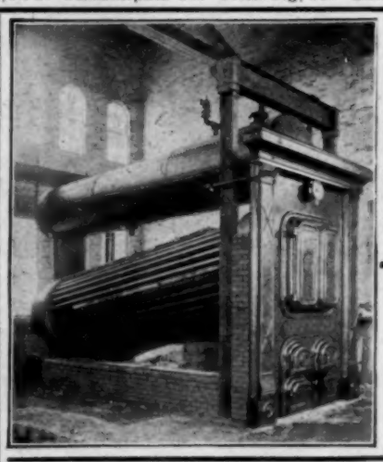

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THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. APRIL 23, 1896. CHICAGO, ILL. NUMBER 17.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Ore purchases by the leading Western steel interest have been made in the past week—the amount covering from 50 to 60 per cent of its requirements. Pittsburg has not been heard from as yet, in any large way, but may come into the market before the end of the month. The sales just made have not only established the ore prices heretofore announced, but have shown the strength of the Bessemer ore producers' organization in its ability to enforce its regulations without discrimination in favor of large buyers. But for this movement in raw material the week would have been without event. Neither in pig iron nor in finished material has there been any break in the dullness that has been marked since the beginning of April. The Southern furnace companies supporting the agreement appear to be holding prices on the basis announced last week—$8.25 for No. 1 foundry, $7.75 for No. 2 and $6.75 for gray forge, Birmingham. At these prices they are from 25 to 50 cents a ton below Northern quotations, delivered. There has been a dearth of foundry buying, with varying reports as to the rate at which iron is being melted. It would seem that there has been no increase in the past few months, except in foundry forge for cast iron pipe. Pittsburg, Chicago, Philadelphia and Cleveland report a dull week for finished material. At Pittsburg, Bessemer pig and billets are weaker. On the latter the competition between middlemen for the small business going has brought a concession of 75 cents from the pool price on prompt sales. From $19.50 to $19.90 is the range of prices. Bessemer pig is weak at $13.25 to $13.50 Pittsburg, according to delivery, though a valley transaction is reported at a furnace price above $12.75, extended deliveries. The absence of demand either for Bessemer iron or billets, or finished product, is furnishing confirmation of the arguments advanced in favor of recent price agreements. If prices can be held through the present halt in demand, a buying movement would find producers in position to undertake profitable contracts at once, instead of being loaded up, as was the case with many last year, with low-price business, taken for the sake of keeping wheels turning. The meeting of tin plate manufacturers at Pittsburg last week developed no plans for new steel plants, though it is understood one or two concerns are figuring on basic open-hearth outfits. It is understood that the cutting of tin plate prices will be much less frequent and that on coke tin plates and machine-made ternes, the following will be adhered to: Seaboard cities, $3.55 to $3.60, basis 14x20 IC; other points east of the Allegheny mountains, 5c advance; Pittsburg and points west of the Allegheny mountains and east of the Mississippi river, 10c advance; Minneapolis and St. Paul, 20c advance.

THE CLEVELAND DISTRICT.

Ore buying by the Illinois Steel Co. has been the chief matter of interest to Cleveland sales agents the present week. It is stated that the aggregate of Tuesday's purchases is between 800,000 and 900,000 tons and that other requirements, amounting to about as much more, will be filled later. Choice low-phosphorus Bessemer ores were bought exclusively, the list including Aurora, at its usual advance in price over Norrie and Tilden; Shores, a new Gogebic ore, of which about 40,000 tons will be produced; Minnesota No. 1 at $4.55; Chandler, at $4.25; from the Mesabi range, Biwabik at $3.65 and Adams; Republic and one or two other ores. The fact that railroad specifications are now calling upon Western and Central Western rail mills for lower phosphorus, the limit being put by some roads at .085, whereas .10 has been specified heretofore, while .11 and .12 have been tolerated, accounts for the pains taken in the ore purchases just made, to secure an ample supply of Bessemers lowest in phosphorus. The range in the ores taken is from .012 to .05, the majority being below .04. With a growing demand, also, among producers of soft steel for ores lowest in phosphorus, it can be seen that they may command even a higher premium than heretofore, and that higher phosphorus ores, just outside the Bessemer limit, may not be used in Bessemer mixtures to the same extent as at present. And with the line mor estrictly drawn as to phosphorus, by makers of Bessemer steel, there will be an increasing movement toward basic open-hearth, which in turn will relieve somewhat the hardships of the producers of non-Bessemer ores. There has been no buying yet by the leading Pittsburg interest, but the question may be expected to come up when the billet pool, which is monopolizing attention at Pittsburg now, is put fairly in working shape. Not a little interest has been quickened in vessel freights by the week's ore sales, and there are reports of one contract for two boats to Nov. 1 at $1.10 and of season business about to be closed on the same basis, but shippers still contest the $1.10 rate. The outcome may appear before the end of the week. Some wild chartering has been done at $1 from the head of the lake, 85c from Marquette and 55c from Escanaba.

Pig Iron. The market has not been more lifeless in weeks. The accumulation of iron at valley furnaces keeps up and there are no definite plans for curtailment. Mary Furnace, at Lowellville, goes out May 1 for relining, and Girard Furnace has for some time planned to go out, but has not announced the date. Buyers of Bessemer iron show no disposition to come into the market and the occasional small-lot inquiry finds some furnace ready to work off some of its accumulation considerably below the $13 basis, furnace, at which valley producers set their peg some time ago. The market is nominally $12.50 to $12.75 in the valley. Foundry buying is scarcely sufficient to fix a market. Quotations are $12 25 to $12.50, Cleveland for No. 2 strong foundry, and $12.75 to $13.25 for No. 1. Southern iron is quite as inactive as Northern. Gray forge has sold on a Pittsburg basis of $11, and a valley sale is reported at $10.50 delivered, with a 25 cent freight from the furnace. Lake Superior charcoal appears to be maintained at the agreed price of $13.50 on Lake Erie docks. The increased cost of non-Bessemer ores is a factor all sellers of foundry irons are considering in calculations for the second half of the

Continued on page 7.

THE CHICAGO DISTRICT.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The amount of business done last week was smaller than the total of the week before, in nearly every branch of the market. Sales of pig iron were considerably less in volume in the week previous, but prices are well maintained by both Northern and Southern producers. In bar iron business was comparatively small and nearly all orders closed were for small lots. In rails a fairly good tonnage was closed. Sales of billets and rods fell off but the inquiry continues large and an increase in sales is expected in the present week. Structural material and plates have not been so active and the demand is more restricted. Sheets and merchant steel have been in excellent demand and good sales were closed last week. Old material has been quiet, with no large sales.

PIG IRON.—The amount of iron sold in this market in the last week was considerably under the total tonnage of the week previous in both Northern and Southern irons. The inquiry, however, continues quite large and a better trade is expected in the present week. Quotations on Northern irons are firmlly maintained by the furnaces, and while here and there rumors are heard of sales of iron at lower figures than the quotations, there appears to be very little foundation for them. Prices of Southern iron are held firmly by the Alabama producers, but some of the selling agents and the Tennessee furnaces are selling iron at 25c a ton under the figures we give. In Lake Superior charcoal a very fair business has been done at current quotations. Prices are now made as follows:

Lake Sup. Charcoal	$13 50@14 00	Southern No. 2 Soft	$11 35@11 60
Local Coke Fdy. No. 1	12 50@13 00	South'n Silveries No. 1	11 85@12 35
Local Coke Fdy. No. 2	12 00@12 50	South'n Silveries No. 2	11 60@11 85
Local Coke Fdy. No. 3	11 00@12 00	Jackson Co. Silveries	14 50@16 00
Local Scotch Fdy. No. 1	12 50@13 00	Ohio Silveries No. 1	15 00@15 50
Local Scotch Fdy. No. 2	12 00@12 50	Ohio Silveries No. 2	14 50@15 00
Local Scotch Fdy. No. 3	11 25@12 00	Ohio Strong Softeners	15 00@15 50
South'n Coke No. 1	12 10@12 35	Alabama Car Wheel	16 85@17 35
South'n Coke No. 2	11 60@11 85	Malleable Bessemer	13 50@14 00
South'n Coke No. 3	11 10@11 60	Coke Bessemer	13 50@14 00
Southern No. 1 Soft	11 60@11 85		

BARS.—Sales of bar iron last week were rather smaller than those of the week previous, but there is still a good demand, and it would appear from this that the lull is only temporary. The 5,000 cars for the B. & O. road, mentioned last week, will be placed in the present week, and orders for the iron will undoubtedly follow. Quotations are firm, as follows: Common iron, 1.30c to 1.35c; guaranteed, 1.35c to 1.40c; soft steel bars from strictly billet stock, 1.40c to 1.45c.

RAILS AND TRACK SUPPLIES.—A fair amount of business was closed last week in this market, mostly in small orders. The inquiry continues good. Quotations are as follows: Rails, $29; splice bars, 1.40c to 1.45c; track bolts with square nuts, 2.15c to 2.25c; hexagon nuts, 2.40c to 2.45c; spikes, 1.70c to 1.75c.

BILLETS AND RODS.—While the tonnage of soft steel closed last week was considerably under the total of the week previous, there is a large demand still unsatisfied, that will probably furnish for the near future. Prices are unchanged at $21.25 for billets and $30.50 for rods.

STRUCTURAL MATERIAL.—General business is quiet, with no indications that it will increase to any great extent very soon. Bridge building and railroad business is taking the larger share of the tonnage of this district and several round orders that have been in hand for some time will be placed soon. Among others an inquiry has been received from the Great Northern railroad for 1,100 tons of bridge material. The Pennsylvania company is to build a new station at Columbus, O., requiring about 1,600 tons of material. Prices are unchanged, as follows: Beams and channels, 1.65c to 1.70c; angles, 1.45c to 1.50c; plates, 1.50c to 1.55c; tees, 1.65c to 1.70c. Small lots from stock are quoted ¼c to ½c higher.

PLATES.—A comparatively small business was closed last week but the orders taken were at satisfactory prices and the demand is expected to keep up. Quotations are unchanged as follows: Tank steel, 1.50c to 1.55c; flange steel, 1.75c to 1.80c; fire-box steel 2.35c to 5c; boiler tubes, 65 and 10 to 70 and 10 per cent discount.

SHEETS.—The demand for both black and galvanized sheets keeps up excellently. Quite a large tonnage was closed last week. Quotations are now firmly made at 2.35c for No. 27 black and 75 and 10 per cent discount for galvanized.

MERCHANT STEEL.—The inquiry is very fair and a satisfactory business was closed last week in both mill and store orders. Quotations are very firm and are unchanged as follows: Open-hearth spring, tire and machinery steel, 1.85c to 1.95c; smooth finished machinery steel, 1.65c to 1.70c; smooth finished tire 1.60c to 1.65c; tool steel, 5.50c to 7.50c; specials, 11c and upwards; Bessemer bars, 1.55c to 1.65c.

OLD RAILS AND WHEELS.—The week has been a very quiet one and the demand is small. Prices are unchanged. Old wheels are quoted at $13.50 to $14; old iron rails, $14.50 to $15; old steel rails, $11 to $11.50.

SCRAP.—The call for old material is considerably smaller and only a few small sales were made last week. The following are buying quotations furnished by dealers: Railroad forge, $13 to $13.50; dealers' forge, $11 to $11.50; No. 1 mill, $8.25 to $8.50; heavy cast, gross ton, $10; malleable cast, $11.00 to $11.50; axles, $15; cast borings, $5.00; wrought turnings, $6.50; axle turnings, $7.25; mixed steel, $8 to $9; stove plates, $7; heavy melting steel, $10.50 to $11.00.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. Neither Bessemer pig iron nor steel billets have changed materially since last report. Both are dull, and Bessemer is lower, while sales of steel by dealers who are having that market to themselves show a further reduction from the pool price. All departments of the market are in position to respond quickly to the most moderate buying movement, but it does not come. The members of the billet pool have a meeting in this city on Friday to arrange details of a reduction in the output. The question under discussion of late is whether any mill or mills will be kept inactive for a definite time, drawing their tonnage allowance and a bonus from the pool. It is reported that Mr. Geo. S. Griscom, formerly president of the Moorhead-McCleane Co., is to be the secretary, with headquarters in Pittsburg. Bessemer iron has been practically at a standstill, so far as business is concerned, and the price is quoted a shade below last week's—$13.25 to $13.50 for April and May delivery. For deliveries extending through the quarter the higher price could probably be had. Buyers are few. Billet sales have shaded the established price from 50 to 75 cents. There are all sorts of reports as to the profits that will be realized by certain selling interests on steel that was bought at the low prices of the first quarter of the year. Sales in 500-ton and 1,000-ton lots have been made the past week at prices ranging from $19 50 to $20. The purchase of the Columbia Iron & Steel Works has been referred to as a move of the broker interest to supply itself with billets; but it is understood to be the intention to produce structural shapes

for the most part, as was done when this mill was last operated. There has been no special activity the past week in any line. Forge iron is in some demand, with Southern delivered at $10.50 to $10.65, and local or valley iron at $11. Foundry iron is quoted at $12.25 to $12.50 for No. 2, and $12.75 to $13 for No. 1. Structural material and plates have been quiet. We quote 1.45c for beams and channels, 1.25c to 1.30c for angles, 1.35c for universal plates and 1.55c for tees. Plates vary $2 a ton in quotations of different mills. We quote 1.35c to 1.40c for tank, 1.45c to 1.50c for shell, and 1.55c to 1.60c for flange. Open hearth stock is held at the higher quotations. Bar steel does not yet respond to the higher price for billets, and some business has been taken at 1.10c, half extras, though 1.15c is the minimum with some sellers. Bar iron is maintained by the pool at 1.20c in the valley for common, car load lots. Sheets are somewhat firmer, with only moderate business. We quote No. 27 common at 2.25c; galvanized at 75 and 10. Rods were not changed, in view of the failure of matters to agree at the Cleveland meeting. The market may be quoted at a $6 advance over the established price for billets, or $26.25. The tin plate manufacturers' meeting succeeded in getting a more general representation of that industry in the association than heretofore. Prices were advanced a trifle and it is believed will be better held than heretofore. The talk of starting open-hearth plants is still only talk; though the matter has been discussed by some producers for some time, in view of the difficulty of getting open-hearth bars. In old material there is a somewhat firmer feeling, though business is limited. We quote old steel rails $13.75 to $14; old iron rails $16.50; No. 1 wrought scrap $13; wrought iron turnings $8; heavy mixed steel $13.

Buffalo. While the pig iron market in this vicinity has been rather quiet, yet several good-sized orders have been placed for Northern iron for reasonably early delivery. As a general thing, however, both consumers and producers of foundry iron are awaiting the action of the ore men. As soon as the price of non-Bessemer ore is set for the season and the cost of Northern iron settled, the local furnaces will feel more like selling for extended delivery. Consumption of foundry iron seems to be holding its own at least. The scarcity of cast scrap has caused some foundries to discontinue its use and others to substitute a close grade of pig iron, both of which increases the consumption of pig iron. Lake Superior charcoal is quiet, sales being confined to small lots to piece out until navigation opens. We quote No. 1 strong foundry at $13@$13.25; No. 2 at $12.50@$12.75; Ohio strong softener No. 1 at $13@$13.25; Jackson County silvery at $15; Southern soft No. 1 at $12.15; Lake Superior charcoal at $13.50 to $14.

Cincinnati. The anticipated lull is here, and producers and consumers now have an opportunity to review the past and attempt to look into the future. The Southern furnace companies that sold heavily feel they have no reason to be anxious at present. It is their hope that general business will revive before their order books are depleted. Other producers with contracts that do not fit their current output are pushing for business, but want full prices. Foundrymen have mostly covered for their requirements during the first half of the year and are now waiting developments in their trade. It would not be surprising if the quiet period extended for 30 days longer. During the week sales have been made at $7.75 for No. 2 foundry, $7.25 for No. 3 foundry and $6.75 for gray forge, cash Birmingham. Northern furnaces did not experience such a rush of orders as did those in the South, and there has been little change in prices. All seem to realize that iron will cost more to make after the new ore supply is purchased, but it has not been possible to stimulate buying to an extent that would warrant refusing to sell at current quotations. Lake Superior charcoal iron is firmly held at the advance and some sales of round lots have been made.

Lake Superior Iron Mines.

The Tilden Iron Mining Co. has just been incorporated under the laws of West Virginia to take over from the receivers the property of the Penokee & Gogebic Consolidated Mines, which takes in the Tilden mine and various undeveloped mineral lands. Other properties, formerly operated by the Penokee & Gogebic Consolidated Mines, were surrendered to the lessors, it will be remembered, within the past two years. The officers of the Tilden Iron Mining Co. are: C. F. Rand, president; Chas. W. Harkness, vice-president; Chas. E. Scheide, treasurer; E. V. Cary, secretary; Wm. C. Tegethoff, assistant secretary; Geo. Welwood Murray, general counsel; W. J. Olcott, general superintendent. The directors are C. F Rand, Chas. W. Harkness, F. T. Gates, Chas. E. Scheide and Geo. D. Rogers. Oglebay, Norton & Co., who were sales agents for the Penokee & Gogebic Consolidated Mines and afterward for the receivers, will continue to act in that capacity for the new company. The Tilden mine is an important Lake Superior property and one of the largest producers on the Gogebic range. Its shipments last year were 418,188 tons.

The movement to curtail production of ore, in view of the fact that stockpiles already contain a large percentage of the ores of certain grades that are likely to be sold this year, has extended to the Ishpeming district. W. G. Pollock, of the Lake Angeline, W. D. Rees, of the Lake Superior, and W. G. Mather, of the Cleveland-Cliffs Co. spent last week at the mines making arrangements for gradual reductions in the output of the mines in the next 60 days. The Lake Superior and Cleveland-Cliffs will lay off about 100 men each at the end of the present week and the Lake Angeline a larger number. By the end of May the number of men employed at the three properties will be from 600 to 700 men less than that of to-day.

At the Minnesota Iron Co.'s Butte shaft at Soudan, Minn., a vein of Bessemer ore 90 feet wide has been proved up, after drilling 276 feet from the fourth level. There are upwards of 1,000,000 tons in sight.

The De Soto Iron Co., that has undertaken to redeem the Mansfield mine, the only Bessemer property in the Crystal Falls district, has been organized under the laws of Illinois. E. E. Crepin is president, Frank Scadden is vice-president and general manager, M. S. Sanders secretary, and R. Floyd Clinch treasurer. A contract has been let for a change of the course of the Michigamme River. A canal will be cut 2,300 feet in length and 300 feet east of the old river bed. Two large dams will be built, one above the mine to turn the water into the new channel, and the other below the mine to take care of the back water.

Personal.

W. A. Cowley, manager of the Benicia Agricultural Works of Baker & Hamilton, San Francisco, Cal., is in the East on a tour of inspection, and passed through Chicago last week.

President W. A. Rogers, of the Tonawanda Iron & Steel Co., Tonawanda, N. Y., has been in Cleveland the past week.

H. C. Frick, chairman of the Carnegie Steel Co., will build and put under the care of the Episcopal Church a $500,000 hospital for children, at Squirrel Hill, Pittsburg. The grounds will take in 40 acres.

Fred Woodbury, mining engineer, formerly at the Chapin mine and latterly with the Calumet & Hecla Co., has resigned his position to become general manager of the Dunn Iron Mining Co.'s mines—the Dunn at Crystal Falls, and the Pence, Windsor, Palms, Colby and Anvil on the Gogebic range. Thos. F. Cole, whom he succeeds, will devote himself entirely to the properties of which Corrigan, McKinney & Co., of Cleveland, are the sales agents.

President John W. Gates, of the Illinois Steel Co., has been in Cleveland this week in conference with iron ore selling firms.

THE IRON TRADE REVIEW

DEVOTED TO

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APRIL 23, 1896.

SOME CONSIDERATIONS AS TO COKE.

The probable life of the $2 Connellsville coke basis is a question of not a little interest to blast furnacemen who have depended upon that region for their fuel supply. With merchant furnaces particularly, in view of the other developments affecting their status that have come up for consideration in the last few months, the high price of coke has prompted investigations that may work out to a greater independence of the Connellsville fuel. A year ago, when the first advance from the disastrous competitive prices of 1893 and 1894 was made by Connellsville operators, there was no complaint. It was recognized everywhere that the policy of giving away the rich stores of the choicest fuel deposits in the country was ruinous, and that higher coke and higher coke labor would aid in industrial recovery. Then came a second advance and a third, with no diminution in the amount of Connellsville coke used. The boom in iron was on, and competing coke districts were not then in position to increase greatly their output; furnaces were making a profit unknown in years and the question of fuel cost was of far less moment than that of getting an ample supply.

The situation to-day is quite different. The inability of the market to take up the product of all the furnaces heretofore using Connellsville has been painfully in evidence since the beginning of the year. The prices of pig iron have been so low that $2 coke has made it a serious question with many furnaces whether operation should be kept up. Perhaps there would have been a general acquiescence in the advance to $2 if, as with the ore advance, there were the assurance that all pig iron producers would be on the same basis. But the practical identity of the controlling coke company and the leading steel producer introduced one large element of inequality in cost. Then the one important Connellsville interest that dissented from the $2 arrangement, supplied a few customers with coke at a cut price, enlarging by so much the factor of discrimination. Pocahontas-Flat Top coke companies, aided by their railroads, were able to make a considerably lower delivered price to certain other furnacemen. The Chicago district, which for several years had been using some Pocahontas coke, greatly reduced its receipts from the Connellsville region and drew more than ever upon the Pocahontas. Cleveland and Columbus, O., have also largely increased their shipments of Pocahontas coke at a price about 75 cents a ton below that of Connellsville. Coke from other Pennsylvania districts than the Connellsville has also found an increasing market. Instead of variations of from 15 to 25 cents a ton in the cost of coke to various consumers, under the old competitive regime in the Connellsville region, the unyielding $2 price of to day has given a market for so much non-Connellsville coke, that the furnace paying $2 at the oven may have a competitor whose fuel cost is less by nearly $1 a ton. So wide a difference means that one furnace can sell at a fair profit on a low market like that of the past five months, while another can compete only at a loss.

That the effect of $2 coke has been to reduce the demand is apparent from the figures showing the production in the Connellsville region. Last fall the output was at the rate of 8,500,000 tons a pear. To-day it is at a 6,000,000-ton annual rate. In the week ending Oct. 5, 1895, with 15,561 ovens active, the estimated production of Connellsville coke was 166,200 tons. In the second week of January this year with 15,069 ovens active, the output was estimated at 146,080 tons. In the week ending April 11, there were 11,436 ovens going and the week's production was about 117,000 tons. A large share of the shrinkage falls, of course, upon the Frick Coke Co. Under the arrangement by which it controls the output of the smaller producers, their product is marketed in any event, at a very small margin of profit to the Frick interest. And though the latter has this advantage, that it is conserving its deposits of coal, while those of the smaller coke companies are being exhausted, it is a question whether these deposits are being husbanded for any such profit as is possible to-day under a $2 market. The amount of hitherto non-coking coals that are to enter into blast furnace burdens in the next few years, through the use of retort ovens, means competition that may be quite as severe as Connellsville coke companies have had among themselves.

How much $2 coke has had to do with stimulating the retort oven industry, it would be difficult to measure. Even while Connellsville coke was at 90 cents and $1, arrangements were being made to transplant Continental economies in by-product recovery to the United States; and owners of other than Connellsville coals have naturally had an interest in pushing any project that would make their coal available for metallurgical fuel. But it is not suprising that the high fuel cost to valley, Wheeling and Pittsburg furnacemen in the past few months, has set some seriously in quest of cheaper coke, who have not felt moved heretofore to take up the question. The 60-oven plant of Otto Hoffman ovens at Johnstown, to which an addition is now projected; the Dunbar Furnace Co.'s Semet-Solvay ovens, now going into operation, and the smaller plants erected on the Carves-Huessener and Slocum system, have taken the question beyond the experimental stage, and to-day those who control the rights of the leading retort systems in the United States are busy with negotiations that are expected to add a number of important plants to the list in the coming year. One Shenango valley furnace company is now building 30 Semet-Solvay ovens, and at Glassport, two miles from McKeesport, a battery of 120 Otto-Hoffman ovens is now under way, the coke and most of the gas to be consumed by the Monongahela furnaces and the identified plant, the National Tube Works. In the Wheeling dis-

trict a similar plant is projected. At Youngstown, O., a project is under way that contemplates the utilization of a system of pipes already underground, for city lighting and for the distribution of fuel gas. Retort coke ovens are to be employed, with the saving of by-products, and Mahoning valley furnaces, now depending upon the Connellsville region, are to take the coke. Another project that is yet in embryo, may develop in the near future. The well-known firm of M. A. Hanna & Co., having furnaces in the Shenango Valley and at Buffalo and controlling Youghiogheny coals that can be coked in retort ovens, is considering the establishment of its own coke plant. Still another possible plant will employ Columbiana county coal, which for some years has been successfully coked on a moderate scale, in bee hive ovens.

The guarantee that the cost of coke, when the returns from by products are deducted, will not be more than that of the coal delivered at the coking plant, is naturally an incentive to active preliminary investigation by furnace companies now paying from $1.25 to $1.75 more for Connellsville coke delivered, than it would cost to deliver on their sidings coal from which a good blast furnace coke could be produced in retort ovens. Meantime the attitude of the Connellsville interest will be watched with interest. The view may be taken that the profits from $2 coke are to be harvested as long as the diversion of trade to other regions is not too serious, and that in any event the retort oven industry is sure to cost the Connellsville region a large fraction of its trade in the end. On the other hand, is the alternative of reducing the Connellsville price to a point that will make by-product propositions less of a temptation to furnacemen, and thus delay for some time serious inroads from that direction.

THE exports of tin plate from Great Britain to the United States in the first quarter of this year foot up 27,744 tons. In 1895 the year's total was 222,901 tons, and in the first quarter, 60,240 tons. In 1894, the total for the year was 226,879 tons, and for the quarter ending with March, 48,616 tons. It will be seen that the rate for the first three months of this year is only half the average yearly rate in 1894 and 1895, and is also half of the average of the first quarters of the two years in question.

THE CLEVELAND DISTRICT.—Continued from Page 3.

year. Quotations have been made from 50c to 90c above last year's prices, by some sellers of non-Bessemers, but there is no concerted arrangement as yet for agreed prices.

Finished Material.

It has been a quiet week locally for most mill products. Some plate business has been done, a 200-ton contract being the largest reported. We quote 1.30c to 1.35c Pittsburg for Bessemer tank, and 1.35c to 1.40c for open hearth plates. Eastern mills seem to hold fully up to the Pittsburg basis on plates and shapes, in making quotations at mill, and, therefore, are doing little business in this territory at present. The new billet basis is not yet reflected in finished material markets. We note a sale of 1,000 tons of billets at $20.25, Cleveland, or 50 cents below the pool price. The spring weather of the past fortnight has brought a better demand for wrought pipe, plain and galvanized; and building work has helped the market for galvanized sheets. We note no change in prices: Beams and channels 1 54c, Cleveland; steel bars, 1.20c to 1.25c; bar iron, 1.20c; No. 27 sheets, common, 2.30c to 2.35c; galvanized 75 and 10 per cent off.

MESABI ORES AND TOP EXPLOSIONS.

TO THE EDITOR:

I recently had Mr. O. O. Laudig, chemist of the Buffalo Furnace Co., make an investigation of the action of furnace gas on a large number of ores. The gas was drawn from 10 feet below the stockline and passed over all the samples at the same time and under as nearly the conditions existing in the upper zone of the furnace as was practical. The ores were treated for two and one-half hours. Analyses of the entering and issuing gases showed that carbon deposition and reduction were as active at the end of the experiment as at any time during the period. A great variation in the amount of oxygen lost and carbon deposited was noted. It was also noted that the amount of reduction and carbon deposition bore little relation to each other, and that the physical appearance, hardness and grade of the ore, with the exception that magnetites were very little affected, were no indication of either the amount of carbon deposited or of oxygen lost. Some of the results as to carbon deposition were as follows:

Old Range Ores.

No. 1.	Carbon deposited,	23.60	per cent.
" 2.	" "	16.88	" "
" 3.	" "	12.88	" "
" 4.	" "	6.96	" "
" 5.	" "	4.72	" "
" 6.	" "	4.66	" "
" 7.	" "	2.50	" "
" 8.	" "	1.56	" "
" 9.	" "	.00	" "

Mesabi Ores.

No. 10.	Carbon deposited,	36.40	per cent.
" 11.	" "	22.08	" "
" 12.	" "	17.78	" "
" 13.	" "	11.20	" "

Cinders.

No. 14.	Carbon deposited,	.74	per cent.
" 15.	" "	.08	" "

Scales.

No. 16.	Carbon deposited,	.62	per cent.
" 17.	" "	.18	" "

The ores treated were from the larger producing mines, especially so in the case of the Mesabis.

The excessive carbon deposit, I think, is the cause of top explosions in furnaces using Mesabi ores. It was noted, in the case of ores depositing large amounts of carbon, that the ores themselves occupied a greater space after than before treatment, and that the Mesabi ores swelled more than the old range ores. For example, No. 13, with the carbon deposited, occupied six times the space No 4 occupied, and three times that of No. 2, while the expansions of Nos. 10, 11 and 12 was greater than of No. 13.

It therefore seems more than reasonable to suppose that the fine ore and fine carbon clogs the passages through the coke and stone to such an extent that the gas at times cannot force its way through till the pressure in the upper part of the furnace is raised greatly. Then the sudden giving way of the obstruction and the rush of gas carries bell, hopper and stock with it.

In taking gas for the experiment, I noted that the gas pressure above the stock line was four inches of water, and at 10 feet below the stock line was 15 inches. It requires an exceedingly short time—seconds, not minutes—to raise the pressure in a furnace of 13,000 cu. ft., filled with stock, into which 25,000 to 30,000 feet of air is being blown per minute, to near the pressure of the entering blast, if the upward passage of the gas is cut off entirely or in part. A pressure of very much less than 10 pounds at a point 20 feet from the top would be ample to do much greater damage than has yet occurred.

If my theory is correct, the prevention of explosions is reduced to the selection of an ore mixture not depositing an excessive amount of carbon, a furnace using one-third each of ores Nos. 1, 2 and 10 being much more likely to blow off its top than one using one-half of 10 and one fourth each of Nos. 7 and 8.

Certain old range ores have become favorites for mixing with Mesabis. So far as I am acquainted with these ores, I find that they lose their oxygen easily and absorb the smaller amounts of carbon.

F. E. BACHMAN.

BUFFALO, N. Y., April 20.

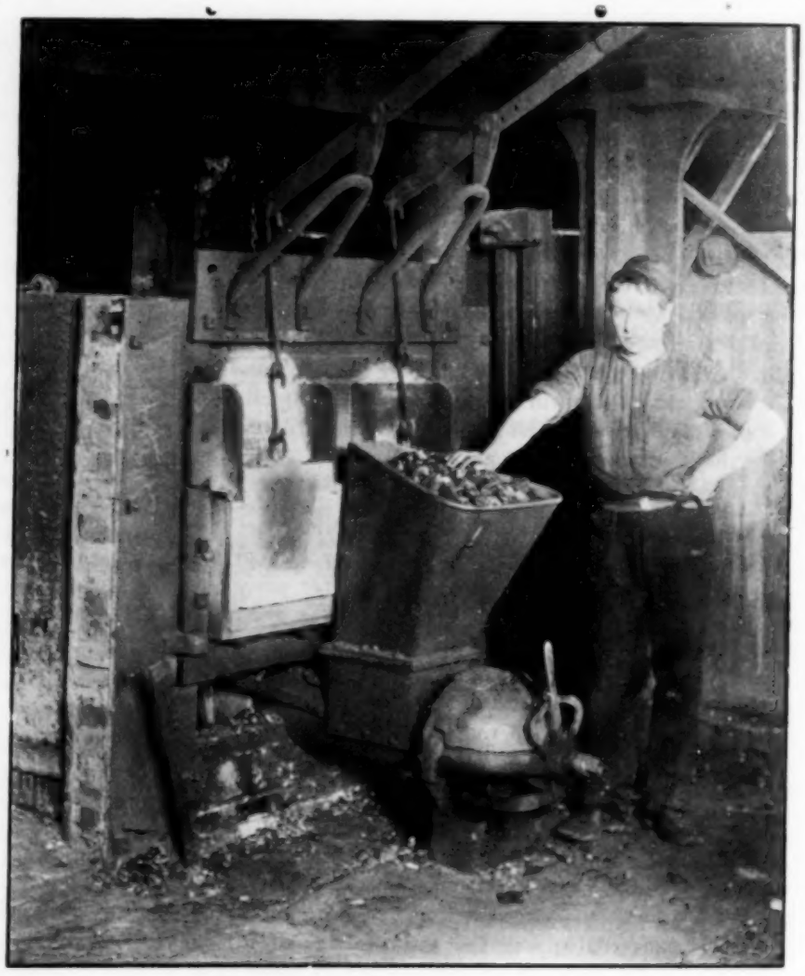
MECHANICAL STOKERS FOR PUDDLING AND HEATING FURNACES.

Probably no subject connected with the economical production of steam and steam power is receiving more attention from manufacturer and engineer than the application of the mechanical stoker to steam boilers. The losses occasioned by the use of grate bars with hand firing were recognized by early steam engineers, and many devices were employed to increase the furnace efficiency. Faulty design, the application of incorrect principles or the imperfect mechanical construction of these devices, coupled with the difficulty of adapting them to the great variety of existing conditions, have restricted their general use until within the last few years. Some of the later designs have surmounted the early difficulties attending the use of mechanical stokers, their value being demonstrated by their rapid adoption.

But while these economies have been attained in operating boiler furnaces, other types of furnaces are yet fed by hand, with the losses attending that method. In view of this fact, not a little interest attaches to the results accomplished with the mechanical stokers installed under the puddling and heating furnaces at the Piqua Rolling Mill Co., manufacturers of iron and steel sheets, Piqua, O. Theirs is believed to be the first mill so equipped; and aside from the novelty of the application, interest attaches to the extent to which the usual hand-fired losses have been overcome, and to other advantages which make the stoker application to heating and puddling furnaces doubly valuable.

Previous to the use of mechanical stokers in this mill, oil had been the principal fuel used for several years, and had been substituted for coal with the object of obtaining increased furnace capacity, and decreasing the labor and care required for its operation. It was afterward ascertained, however, that the greater capacity was obtained at an increased cost of output.

The attention of the company was called to the American underfeed stoker, manufactured by the American Stoker Co., of Dayton, O. The claims made were its simplicity and compact design, which would enable it to be installed without the alteration of any part of the furnace. It was believed that if the claims made by its makers, of durability under severe conditions, economy, and its capability of being forced and withstanding the most intense heat, were sustained, the cost of a furnace output might be reduced below that of coal hand-fired, and a capacity attained equal that of a furnace using oil as a fuel. Arrangements were made for the trial of one stoker and that the expectations of both purchaser, and maker have been realized appears in the complete equipment of the mill after a test extending over several months.



AMERICAN STOKER APPLIED TO PUDDLING FURNACE

This mechanical stoker in position in a puddling furnace is shown in the sectional views. The action and principle of this stoker are as follows:

Coal is fed into the retort C by the worm conveyor B, which receives its movement from a ratchet wheel and rock lever at the end of a shaft outside of the furnace. Surrounding this retort and conveyor is a casing forming a passage for the air which enters at the opening E and passes underneath and around the retort and is released from the tuyere blocks at D. The action of the conveyor feeds the coal slowly up, and as it approaches the surface of the fire it becomes gradually heated. The volatile products distilled off by the heat pass up through the incandescent bed of fuel, where they become mixed with the heated air issuing from the tureres and are consumed. The coal upon arrival at the surface of the fire has given up its gases and has become coke, which spreads over the entire grate surface. The result is complete combustion and a smokeless flame.

In hand firing, the coal is thrown on top of the fire, causing the rapid distillation of the volatile products of the green fuel and a dense smoke at the stack. A surplus volume of air rushes through the firing doors and the grates where thin spots have been burned in the fire and escapes from the stack, with the heat absorbed in its passage through the furnace.

It is this surplus free air that produces the wasting of the iron being worked. That the use of the stoker reduces this surplus air and the consequent waste of iron, is shown by the accompanying table of the trials at the Piqua Rolling Mill.

Two adjacent puddling furnaces, with return tubular waste heat boilers, 60″ diameter x 16′ long, were selected for the trial. Both boilers and furnaces were identical in every particular. One was fired by hand, and in the other a section of the grate bars had been removed and the stoker applied. The draught for the hand-fired furnace was forced to a point where the operator's experience had proven that the best results were to be obtained. The tests, of which results are given below, were made shortly after the stoker had been installed, and before sufficient experience had been acquired by the puddlers in the handling of the stoker to obtain the most economical results.

PUDDLING FURNACE TEST.

Average results of six turns from Sept. 23 to Sept. 25, 1893, inclusive, bushelling light scrap:

	Hand Fire.	Stoker.
Duration of test, total time of six turns, hours	56	54.50
Coal.		
Jackson Ohio, Pea and Slack.		
Total amount consumed, lbs.	23,939	21,443
Amount consumed per hour, "	427.5	391
Iron.		
Total amount charged, lbs.	36,500	37,250
Total weight of output, "	31,585	31,990
Output per hour, "	564	601.6
Output per pound of coal, "	1.31	1.54
Percentage of increase of iron per pound of coal in favor of stoker	.....	17.5
Waste of iron, per cent.	13.5	11.2

BOILER TEST.

Waste Heat from Furnace.

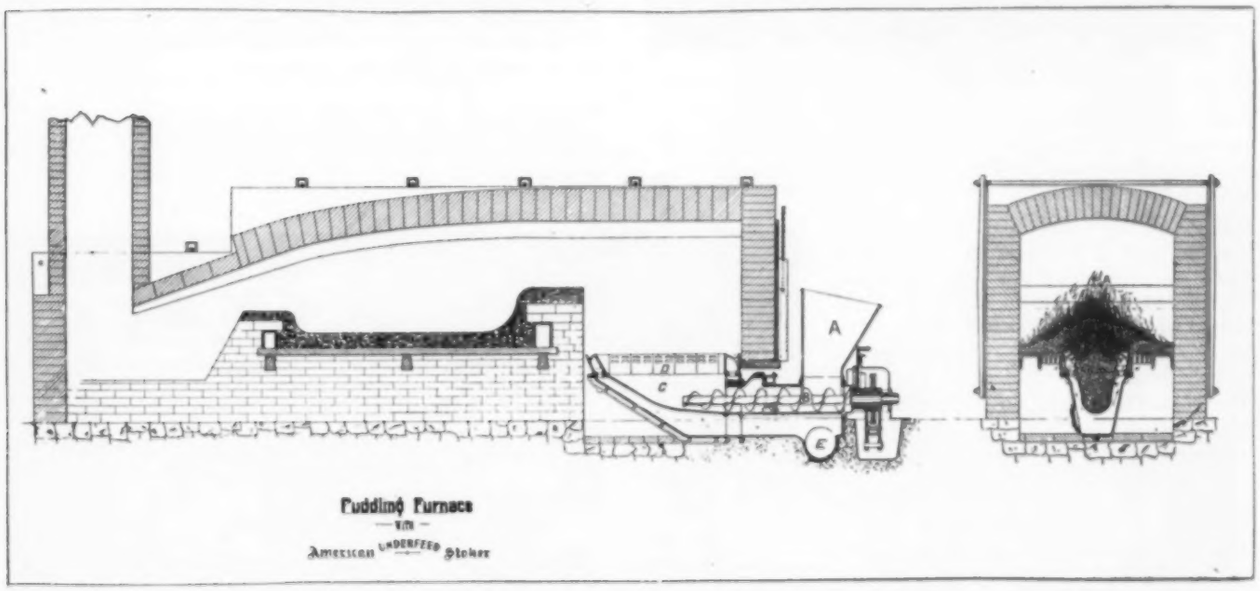
	Hand Fire.		Stoker.	
	1st turn.	2d turn.	1st turn.	2d turn.
Duration of test, hours	7:35	9	7:10	9:50
Grate surface, sq. ft.	10-5	10-5		

	Hand Fire.		Stoker.	
	1st turn.	2d turn.	1st turn.	2d turn.
Heating surface, sq. ft	710	710	710	710
Steam pressure by gauge, lbs	98	103	103	102
Temperature of feed water, deg	133	158	155	158
Coal.				
Jackson, Ohio, Pea and Slack.				
Total amount consumed, lbs	3,180	4,227	2,742	3,783
Amount consumed per hour, lbs	419.3	469	382.6	384
Water.				
Total weight of water evaporated, lbs.	15,600	18,000	16,400	22,400
Water actually evaporated per lb. coal, lbs	4.90	4.26	5.98	5.92
Equivalent water evaporated per lb. coal from and at 212 deg., lbs	5.40	4.68	6.58	6.49
Percentage of increase of evaporation per lb. of coal in favor of stoker			29.6	
Horse power developed	65.6	63.6	73.0	72.4

The tables show these gains by the use of the stoker: 1. Increased output of iron per pound of coal. 2. Increased evaporation of water in waste heat boilers. 3. A decrease in time required for a given output.

New Structural Steel Company for Chicago.

A new company was incorporated in Chicago recently under the name of the Universal Construction Co., Inc., which has taken a lease of what is known as the "North Works" of the Illinois Steel Co., located in Chicago. The stock of the company is held by eastern and Chicago men. It is the purpose of the company to develop the manufacture of structural steel and special shapes, and to cater particularly to the bridge building, railroading and contracting trades. Mr. Fred Heron, who has an interest in the company, and is its general manager and one of its directors, is well known in the iron and steel business, having been long associated with the Homestead Works, in Pittsburg, and for the last nine years with the Phœnix Iron Co., at Phœnixville, Pa. The secretary of the company, Mr. Edward Haupt, has also been for some years with the Phœnix Iron Co. During the last three years the Illinois Steel Co. has been so busily engaged in developing its other plants, which are five in all, that it has given little time to the structural business, and involving as it does an immense amount of detail, has deemed it preferable to lease the plant to a responsible corporation, rather than enter upon this branch of business itself. The plant is rapidly being put in order, and the managers expect to have it in operation within thirty days. In the meantime, the fitting shop is being operated with material supplied from other works of the Illinois Steel Co. and purchased in the open market. The Universal Construction Co. has secured as president, W. R. Stirling, who has long been connected with the Illinois Steel Co. and still retains his position of first vice president with it. It is naturally to be expected that the Illinois Steel Co. will feel a deep interest in the success of the Universal Construction Co., as it will be a large consumer of both raw material and finished products of the Illinois Steel Co.



PUBLICATIONS RECEIVED.

The 1895 bound volume of the *Locomotive*, the excellent monthly of the Hartford Steam Boiler Inspection & Insurance Co., preserves in handy form for reference the valuable matter on the proper construction and care of boilers which comes regularly through this channel. The *Locomotive* has kept steadily on its course, educating steam users in the best practice and suggesting how losses of property and life may be reduced to the minimum. The price of the bound volume is $1; the monthly is 50 cents a year.

The *Bond Record*, of New York, is publishing a most valuable series of articles on the currency question in pursuance of a plan outlined in its February issue. It has arranged with a number of authorities on monetary science to present in its columns an outline of the reforms needed in the currency system of the United States to place it on a stable basis and take it out of politics. The contributions are limited to persons who believe that gold coin of the present standard should be retained as the basis. Each writer is asked to state whether, in his view, the paper money of the nation should be issued by the Government alone, by the banks alone, by both, or under some new arrangement, such as a bank of the United States, corresponding to the Bank of England, Bank of France, etc. Prof. Wm. G. Sumner, of Yale, led off in the March issue with a suggestive article on "The Treasury as a Bank of Issue and a Silver Warehouse." In the April issue are contributions by Prof. F. W. Taussig, of Harvard, on "Immediate and Ultimate Reforms"; by Prof. Irving Fisher, of Yale; A. D. Noyes, of the New York *Evening Post*, and M. L. Muhleman, of the United States Treasury Department. Prof. Taussig recommends as one remedial measure that may be applied in the immediate future, a separate bureau established by the treasury, having funds and resources of its own, whose sole duty shall be the redemption of every form of Government paper in gold and whose resources shall not be liable to drain from any deficiency in the current operations of the treasury. The writer also favors getting rid at once of the treasury notes of 1890. Prof. Fisher's paper is a demonstration that free silver is opposed to the best interests of the "debter class" itself, though the debtor has been treated by all free silver advocates as the beneficiary of such a policy. The *Bond Record's* idea in bringing out this discussion is excellent, and the names promised for later articles are quite as prominent as those of who have already contributed.

The Washington *Post* Almanac and Encyclopedia for 1896 covers the wide range of statistical and other information contained in the more familiar publications of the sort, and apparently has a larger body of additional matter in political, economic, industrial, monetary and meteorological lines. Bronson C. Keeler is statistician and Prof. C. H. Lillingston, Sr., a co-worker of the late Prof. John H. Tice, has prepared the weather departments. There are 500 pages and the price is 25 cents.

E. G. NEWHALL, JR.

The portrait we present is of the junior member of the firm of E. G. Newhall & Co., of Detroit, manufacturers of the "Arm and Hammer" welding compound. In talking with a representative of this paper about the business, Mr. Newhall said: "For many years welding compounds have been peddled around from shop to shop by men who knew how to get up a

compound that would work to perfection, but the cost of it would be so high as to make the compound unsalable. The peddler would show a sample which, of course, would work to perfection and offer to sell it at a reasonable figure. He would deliver the compound and collect part pay for it, the balance to be paid when the compound had been used and found satisfactory; but that would be the last seen of him. When the compound came to be used it would be practically worthless. Another scheme was to have a sample of compound and sell the formula for making it. The sample would be all right, but when the formula came to be used it would not work.

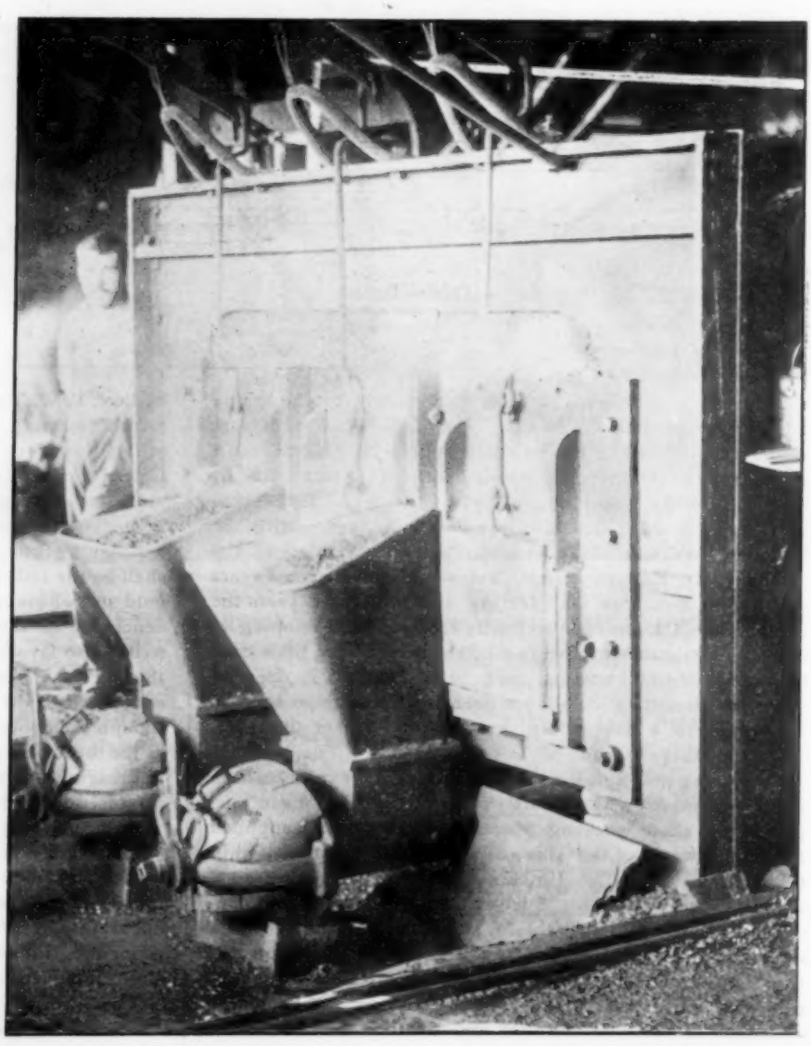
"Thus every one in the business became disgusted with any kind of welding compound; but all this was not without its good features. It led some people to the conclusion that a *bona fide* article, manufactured by responsible people, content with a reasonable profit, who made a business of making a welding compound and put out a first-class article, always the same, could work up a large trade. In this go-ahead time there is a field for people who are specialists in their line, and strong competition compels the manufacturer to use the best goods to be had for his purpose if he is to keep in the race. We are manufacturers of 'Arm and Hammer' welding compound. Why should not the manufacturers buy their welding material of people who make a business of an article for this purpose.

"Some compounds are put up and recommended to do almost everything, like some patent medicines. We are simply manufacturing a welding compound to weld any grade of steel, and for that purpose alone, and make a business of it. We are satisfied we can furnish a superior article in that line; just as an axle manufactory can furnish the carriage-makeraxles cheaper and better than he can make them himself. We use a combination of materials, all of which are beneficial for and especially adapted to this purpose; not a combination of borax and sand. The old axiom that no one can give something for nothing is strictly applicable to this business, and *vice versa*, no one can sell nothing for something. On this principle and always emphasizing the fact that people who are exclusively devoted to the business, can furnish to consumers a compound made especially for welding at a much less rate than they can make it themselves, and at the same time do better work, we have built up a large trade among the foremost manufacturers of steel work."

SHIELDS & LAUER, Cleveland contractors, who bid recently on 6,300 tons of cast iron pipe at $18.25, the next bid being that of the Lake Shore Foundry Co., of Cleveland, at $19.90, have refused to enter into a contract with the city, saying they were misinformed as to the price at which they could buy pipe. The city will probably forfeit the $5,000 bond of Shields & Lauer and enter into contract with the Lake Shore Foundry Co. Officials of the city have been making a hue for months about the "pipe pool" and readvertised with the express purpose of defeating the "pool" and its local representative, the Lake Shore Foundry Co.

THE Sterling Emery Wheel Mfg. Co., Tiffin, O., has never done so large a business as that which has been coming to it in the past few months. Its works are running extra time and are yet unable to keep pace with orders.

T. BURTON & Co., formerly in the Carnegie Building, Pittsburg, have been succeeded by Burton, Blair & Co., with offices in the German National Bank building.



TWO AMERICAN STOKERS APPLIED TO SINGLE HEATING FURNACES.—SEE PAGE 8

ELECTRICALLY OPERATED BICYCLE WORKS

The number of factories operated entirely by electricity and the motor, to the complete exclusion of the steam engine, main belt and other attachments is constantly receiving additions. One of the latest accessions is the Miami Cycle & Mfg. Co., of Middletown, O., which operates an extensive factory in which work from 500 to 600 operatives. From it are turned out daily about 200 bicycles, all of a high grade.

The electrical system employed is the monocyclic, developed by the General Electric Co. It allows, within certain limitations of distance, the economical operation by the single-phase alternating current, of motors and lights from the same circuit, without in any way interfering with the regularity of

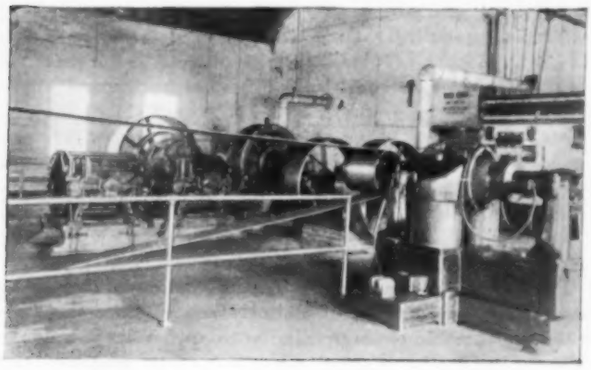


FIG. 1.—INTERIOR GENERATOR STATION, MIDDLETOWN, O.

the lights. For long distance transmission, the three-phase system of the same company has been found most economical.

The current to operate the Miami Co.'s plant is brought about a mile by wire, from the station of the Middletown Electric Light & Power Co., where it is generated from a monocyclic generator, and turned into the wires at 1,100 volts. At the factory it passes into a sub-station and through six 30 kilowatt oil-cooled taansformers, which reduce the pressure down to about 115 volts for distribution to the motors. The current for the lighting circuits is taken from two 7½ k. w. and one 15 k. w. transformers.

From the transformers the secondary wires run north and

FIG. 3.—MACHINE ROOM SHOWING MACHINERY DRIVEN BY MOTORS.

south to the motors and lights in the two legs of the L. Those running south operate in the machine shop three 20 h. p. motors, each belted to a long line of shafting about 180 feet long, carrying 80 belts. One of these motors is used to drive 15 lathes, four shapers, six milling machines, three water emeries, one planer, one die-sinker, two universal grinders, two gear-cutters and two drill-binders. The other two operate 35 screw machines, one oil-separator, one oil-pump and two high-pressure blowers, giving air to the forges in the blacksmith shop.

The circuits running north bring current to three 30 h. p. motors, two of 10 h. p. and two of five h. p. One of the 10 h. p. motors is set up in the drill-room and runs a shaft from which belts drop to 12 large and three small drill-presses, two cone-grinders, and four small milling machines. In addition, it operates one hand-saw, one circular saw, and one wood-turner's lathe in the pattern room adjoining.

The other 10 h. p. motor is in the frame-making department, where it drives three large punch-presses for the manufacture of handle-bars, seat-posts, etc., three large drill-presses, four small ones, two frame assembling-tables, three small milling machines, two emery-grinders, one swaging machine, four stock machines, two tooth-cutters and one double-polishing lathe.

A large portion of the power coming into the factory is used

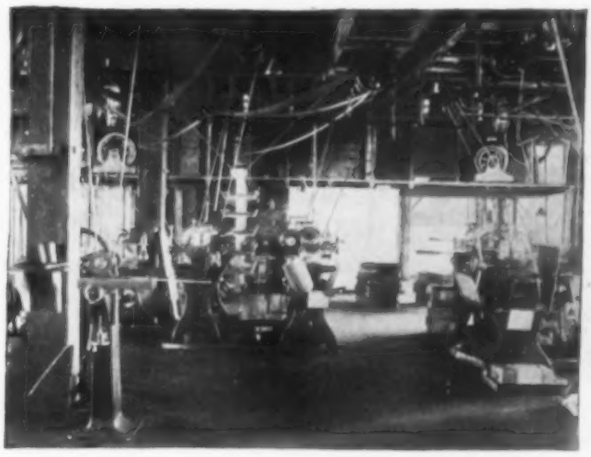


FIG. 2.—CORNER OF MACHINE ROOM SHOWING INDUCTION MOTORS.

in the polishing-room, occupied by 35 double-polishing lathes operated by two 30 h. p. motors. Another 30 h. p. motor drives a 48-inch exhaust blower, which carries away the dust, from the polishing room. In the assembling department a five h. p. motor operates a freight elevator of 1,500 lbs. at 60 feet per minute capacity, running up and down through the room. This five h. p. motor, which was at first deemed too small, not only operates the elevator satisfactorily but also has sufficient power left to drive five small drill-presses. The other five h. p. motor drives a 4 k. w. plating dynamo.

All these motors are of the General Electric induction type, without commutator, collector or moving contacts. They are

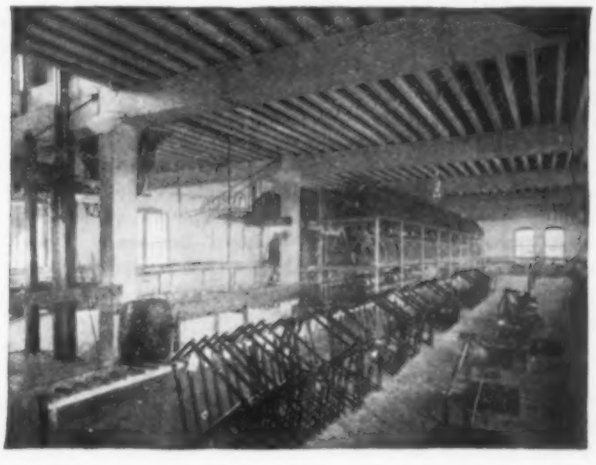


FIG. 4.—PART OF ASSEMBLING ROOM, SHOWING MOTOR FOR ELEVATOR

set up on platforms swung from rafters in the rooms, an arrangement rendered possible by the fact that they require no attention beyond an occasional oiling, and thus occupy no floor space.

Skeptical at first, the company, willing to allow a trial, permitted the installation of a 20 h. p. motor as an experiment. It reached the factory in September, 1895, was put into service in the machine room, and ran the machine for the night shift. The test was severe. The motor ran over 300 ft. of three-inch shafting, 172 belts, five screw machines, and 17 other machines, such as drills, lathes, etc. The usual course was to add machine after machine until the motor stopped. One or two would then be thrown off and under an excessive overload, which brought it within reach of breaking down, the

motor continued to run for its shift of ten or twelve hours' No accident happened to it during the two months this course of treatment continued. It was purchased by the cycle company, which ordered eight others at once, afterwards increasing its order to nine. The constant speed given to the machinery by the motors has permitted the turning out of wheels with workmanship of peculiarly high quality, and they have been compelled to enlarge the works, which are entirely lighted with lamps, taking current from the same monocyclic generator.

In addition to the load at the Miami Cycle Works, the generator supplies current to 500 to 600 lights throughout the town, and 650 incandescents in the Sorg Opera House. With 50 h. p. in motors and 400 incandescent lamps burning at the cycle works, and as many in the city, the lights in the opera house burn brightly and without flickering.

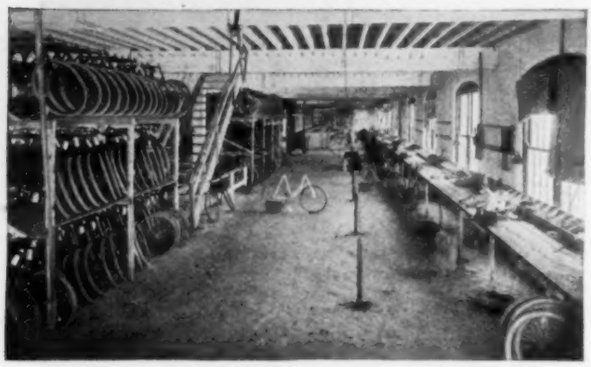


FIG. 5.—ASSEMBLING ROOM.

LAST week the East Chicago Iron & Steel Co., East Chicago, Ind., was placed in the hands of a receiver, E. P. Ames being appointed, by the superior court at Hammond, Ind., on the application of labor creditors. J. J. Parkhurst, president of the company, said in regard to this action that it was possible owing to the peculiar laws of Indiana, and that the company was not given an opportunity to file an answer before the receiver was appointed. The amount involved in the suit was only $57, representing the claim of one employe. The rest of the men were not involved in the suit. The East Chicago Iron & Steel Co. has assets fully equal to four times the amount of its liabilities, according to Mr. Parkhurst, and upon this representation being made to the Hammond court, later in the week, the receiver was discharged. The company has been bothered several times lately in a similar way largely through the instrumentality of some East Chicago and Hammond lawyers, but has never failed to come out of the difficulties satisfactorily to its officers. The company is looked upon in the trade as having an excellent standing.

THE largest leather belt ever made has just been finished by the Chicago Belting Co., Chicago. Its dimensions are: Length 150 feet; width, 7 feet; weight, 3,300 pounds; thickness, 7/8 of an inch. In its construction the selected portions of 450 oak tanned hides, picked from over 5,000 skins have been used. From end to end there is not a stitch or rivet. Glue is the adhesive substance. The belt is for the engine room of the Louisiana Electric Light Co., at New Orleans.

A Year's Operations of the Pennsylvania Steel Co.

The annual report of the Pennsylvania Steel Co. prepared for the annual meeting on May 4 makes the following showing:

Gross sales from Steelton works	$6,679,956
Net profit	452,989
Less interest charges	295,393
Legal expenses for reorganization	35,937
Balance surplus	121,659

During the year 1895 the Bessemer plant was entirely remodeled and considerable improvements instituted in the bridge and construction department, at a total cost of $113,468.

The showing for the Maryland Steel Co.'s plant is as follows:

Gross profit	$242,962
Gross expenditures for interest, reorganization and improvements	278,882
Deficit	35,920

The report states, "Inasmuch as the company starts with a new capitalization of both stock and bonds and the expenses of the year 1895 were increased by the necessary charges incident to reorganization and settlement, it is difficult to compare results with former years, and it is expected that even should the condition of the trade not improve during the year 1896, the income of your company will be sufficient to provide for all its interest charges and leave a substantial surplus." A condensed balance sheet shows as follows:

ASSETS.

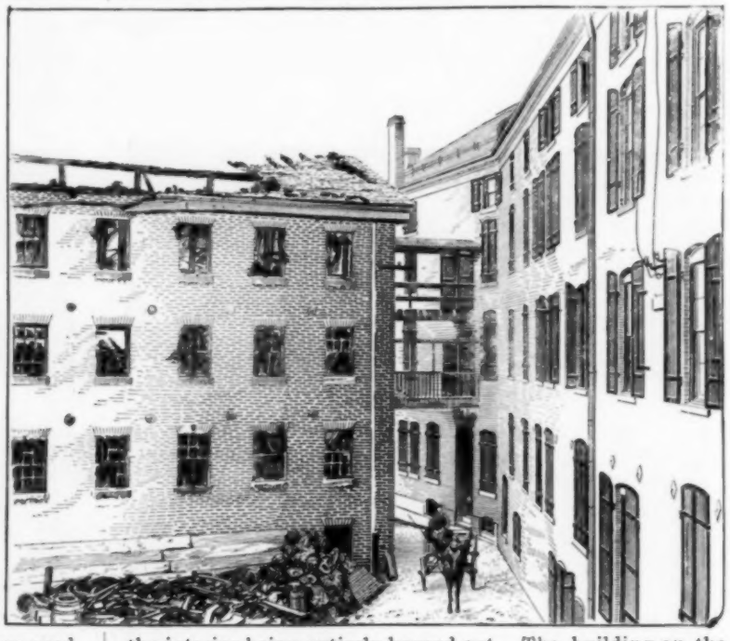
Construction account	$8,345,572
Stocks and bonds owned	3,144,666
Bills receivable	154,811
Material on hand	2,833,210
Accounts receivable	1,116,011
Cash	324,740
Total Assets	$16,017,650

LIABILITIES.

Capital stock	$7,497,500
Bonds	7,000,000
Bills payable	300,000
Accounts payable	1,211,360
Total liabilities	$16,008,860

VALUE OF FIRE-PROOF SHUTTERS.

Protecting buildings from fire in adjacent buildings has always been a problem with architects and engineers. When buildings stand in close proximity to each other it is necessary to protect the openings in order to prevent fire from communicating from one to another. What constitutes the best protection under these circumstances is a question not easily decided, but a case which has recently attracted some attention demonstrates the value of corrugated iron shutters, properly made and properly fitted, as an absolute protection against the spreading of fire. The illustration shown herewith is sketched from the ruins of a fire in the large manufacturing plant of the Russell & Erwin Mfg. Co., at New Britain, Conn. The building shown on the left was destroyed,



the interior being entirely burned out. The building on the right is one of the main buildings, six stories, and had the fire communicated with that the entire plant would have been destroyed. The openings as shown in the illustration were protected by the Berlin Iron Bridge Co.'s corrugated iron doors and shutters, which are nightly closed by the watchman. The heat from the burning building was very intense, yet owing to the window openings on the adjacent buildings being protected with these corrugated iron shutters, no fire communicated across the opening, which was but 15 feet in width, and the entire plant, costing millions of dollars, was saved from destruction. The heat was so intense that an ordinary wooden shutter covered with tin would have been entirely destroyed, and a flat-iron shutter would probably have been warped so as to have been little protection.

THE WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Western Foundrymen's Association was held Wednesday evening, April 15, 1896, at the Great Northern Hotel, Chicago. In the absence of the president and vice president, Mr. C A. Sercomb, of Milwaukee, was elected chairman for the evening.

The following were present: C. A. Sercomb, Schwab & Sercomb, Milwaukee, Wis.; William Bailey, Illinois Iron & Bolt Co., Carpentersville, Ill.; G. H. Carver, E. N. Erwin, Plano Mfg. Co., West Pullman, Ill.; D. L. Cobb, Sloss Iron & Steel Co., Birmingham, Ala.; O. T. Stantial, L. W. Lukens, Illinois Malleable Iron Co.; R. J. Cleveland, Cleveland & Barr; H. S. Vrooman, Garden City Sand Co.; A. M. Thompson, Link Belt Machinery Co.; J. R. Davies, Davies Car Wheel Co.; R. J. Barr, Western Electric Co.; Robert Gibbs, Lake Shore Foundry Co.; C. H. Hopke, Western Foundry Co.; W. C. Waterbury, Forster, Waterbury & Co.; A. Sorge, Jr., M. E.; G. C Batten, Kurtz & Buhrer Foundry Co.; Wm. Ferguson, Gates Iron Works; W. D. Barton, Siemens & Halske; Leo Salomon, Chicago Architectural Iron Works; E. W. Smith, Crane Co.; H. F. Frohman, J. Evans, S. Obermayer Co.; B. M. Gardner, *The Iron Trade Review;* S. T. Johnston, Whiting Foundry Equipment Co.; all of Chicago.

Mr. A. Sorge, Jr., gave the following informal report for the Committee on Headquarters: "We thought we had our plans made for headquarters, but unfortunately they fell through yesterday afternoon. I do not see where we are going to obtain headquarters at present that are suitable for our purpose and still within our means. We had purposed to make arrangements with other societies of a similar character by which we would be able to get joint headquarters, but unfortunately we were defeated in our attempt. I think, under the circumstances that we should be discharged, for I do not believe we can do the association any good at present." On motion, duly seconded, the committee was discharged, with thanks for its services.

The application for membership of the Phœnix Iron Works, of Cleveland, O., was presented, and on motion, the firm was elected a member of the association.

Foundrymen's National Convention.

The secretary then read the following letter:

PHILADELPHIA, April 10, 1896.

"Mr. S. T. Johnston, Sec'y Western Foundrymen's Association:

"DEAR SIR: We are about getting ourselves in shape to send our formal invitation for the call of the National Convention for May 12, 13 and 14 and have used the names you gave us to make the call. The thought strikes me that it might be possible that some of your Western people would like to present a paper or at least propose questions for the question box that might require answers. If such is the case we shall be delighted to hear from you, as it will be appreciated; but advise us as far in advance as possible that we may put the matter in the right place. Hoping to hear from you favorably, we remain, Yours truly,

"HOWARD EVANS, Sec'y."

Nominations for Officers.

The following nominations for officers for the ensuing year were then made:

For President: John M. Sweeney, Chicago Consolidated Iron & Steel Co., Harvey, Ill.; C. A. Sercomb, Schwab & Sercomb, Milwaukee, Wis.; E. E. Hanna, Gates Iron Works, Chicago; A. W. McArthur, Rockford Foundry Co., Rockford, Ill.; A. Sorge, Jr., M. E., Foundry expert, Chicago.

For Vice President: A. W. McArthur, Rockford Foundry Co., Rockford, Ill.; Wm. Ferguson, Gates Iron Works, Chicago; A. Sorge, Jr., M. E, Foundry expert, Chicago.

For Secretary: S. T. Johnston, Whiting Foundry Equipment Co., Chicago.

For Treasurer: O. T. Stantial, Illinois Malleable Iron Co., Chicago; H. S. Vrooman, Garden City Sand Co., Chicago; G. H. Carver, the Plano Mfg. Co, W. Pullman, Ill.

For Directors: J. M. Sweeney, Chicago Consolidated Iron & Steel Co., Harvey, Ill.; W. N. Moore, Joliet Stove Works, Joliet, Ill.; C. A. Sercomb, Schwab & Sercomb, Milwaukee, Wis.; E. E. Hanna, Gates Iron Works, Chicago; Wm. Ferguson, Gates Iron Works, Chicago; H. L. Hotchkiss, Deering Harvester Co., Chicago; J. H. Dalton, Walburn-Swenson Co., Chicago Heights, Ill.; A. Sorge, Jr., M. E., Foundry expert, Chicago; H. S. Vrooman, Garden City Sand Co., Chicago; J. K. Mackenzie, Dickman & Mackenzie, Chicago: Jas. Brady, Kurtz & Buhrer Fdy. Co., Chicago; G. H. Carver, the Plano Mfg. Co., W. Pullman, Ill.; A. W. McArthur, Rockford Fdy. Co., Rockford, Ill.; J. T. Rowlands, J. I. Case T. M. Co., Racine, Wis.

For Editing Committee: B. M. Gardner, *The Iron Trade Review*, Chicago; J. K. Mackenzie, Dickman & Mackenzie, Chicago, Wm. Ferguson, Gates Iron Works, Chicago.

Irregular Grading of Foundry Iron.

Topical question No. 5, was then read to the association for discussion as follows: "Are foundries generally noticing an irregularity in the grading of foundry pig iron? If so, does this irregularity exist more generally in Northern than in Southern irons? Does it apply to both charcoal and coke irons, and in your opinion is any of the difficulty traceable to an extreme desire of the part of furnaces to supply their Bessemer pig iron trade at the expense of their foundry trade."

The Secretary read the following letters from foundrymen:

RUSSELL & CO. MASSILLON, O.

Complying with your request of the 26th ult., will say, we have noticed for some time an irregularity in the grading of foundry pig iron, and a strong disposition on the part of furnaces to grade by analysis, rather than by fracture. This has, at times, been very unsatisfactory to us. Several lots of iron would, apparently, be composed of irons from 1 to 4, when judged by their fracture, and yet, we were told, they were all according to a certain given analysis, and graded accordingly. Whether the analysis is always correct or not, we are not able to say, but when looking at the fracture of an iron we have, at least, an idea of its grade, and until the time comes that every foundryman can afford to keep a chemist employed who could analyze all irons received, the grading by fracture would seem more satisfactory. Yes, our experience points to a greater irregularity in Northern than in Southern irons. We use no charcoal iron, and, consequently, cannot say anything about this. Whether the difficulty is traceable to an extreme desire, on the part of furnaces to supply their Bessemer pig iron trade at the expense of their foundry trade, we are unable to state. But the above remarks fairly represent our experience and opinion on the subject.

MOLINE PLOW CO., MOLINE, ILL.

Replying to your inquiries, will say that we have noticed irregularities in the grading of the foundry pig iron and those irregularities exist more in our experience, in the Southern iron than in the Northern. It applies to both charcoal and coke irons, and we are inclined to the opinion that the difficulty is traceable to the extreme desire on the part of the furnaces to supply their Bessemer pig iron trade at the expense of the foundry trade.

AULTMAN, MILLER & CO., AKRON, O.

There is constant difficulty caused by irregularity of pig iron furnished for foundry purposes. Nothing but "eternal vigilance" keeps the iron anywhere near regular. There is more trouble with Southern irons than with Northern. I hardly think it is caused by the desire to furnish Bessemer pig. My experience runs back before the Bessemer times when the same difficulties were constantly met. I think it is caused by some irregularity of the working of the furnaces, and the employment of incompetent men as inspectors or graders. No doubt the price for Bessemer, foundry and mill iron has something to do with constantly getting more iron into higher grades that should go into such grades.

R. D. WOOD & CO., PHILADELPHIA, PA.

In reply to the question you ask, we would say that our experience is that each furnace has its own method of grading and that each follows this out with as much steadiness as can be reasonably expected. Of course, there are variations which can only be expected; otherwise we have not noticed any marked tendency.

LANE & BODLEY CO. CINCINNATI, O.

Answering your circular letter of March 26th relating to

irregularity in the grading of foundry pig iron, will say, that we have not noticed any change in the matter recently. We do not use any of the Northern irons, if you mean by that those made north of the Ohio line.

THOS. D. WEST, SHARPSVILLE, PA.

The writer is not familiar with the causes that have led up to the inquiry for this evening's discussion, but is inclined to think that some intelligent founder who works entirely by furnace alalyses has found his mixtures do not give the results which they should and being suspicious of something wrong, has suggested the question of the evening with a view of a remedy being developed or the evils thoroughly ventilated.

The practical founder will admit that there are ways by which he can distort a true mixture by actions of the fuel, fluxes, mode of charging and blast in a cupola; and while the furnaceman is often held responsible for ill results which were really the founder's own fault, still there is need for more rigid practice in grading irons.

The writer cannot think that the question as put has any reference to judging of iron by its fracture, simply because the grain of pig metal cannot be relied upon to give any fair approximation of what percentages of sulphur, silicon or any other metalloid the pig metal may contain. The founder is sure to find more or less irregularity in the appearance of irons received from any furnace, grading their metal entirely by chemical analysis. The fact that iron looks irregular in its grain or fracture is no evidence that it will not come out all right when remelted, providing a correct analysis has been given, and it has been well mixed before shipment and is remelted in good, regular order. It is only by chemical analyses, or the regular remelting of pig metal that the true grade of iron can be defined.

Granting that the query of this evening's discussion has no reference to judging iron by its fracture, the writer must then conclude that the trouble that has been experienced is due to the chemical analyses as given having proved incorrect by the test of remelting. The writer knows that present practice is attended with trouble and loss to the founder, and believing the issue should be met squarely and frankly and that in the end the furnace man will be benefitted, as well well as the founder, no one should hesitate to give freely his knowledge and experience on the subject.

The founder who adopts chemistry must have his practice perfected as far as possible in all its details before he can be sure of always obtaining desired results from mixtures in remelting pig metal. There are two evils that can cause a founder loss and trouble. One of these is the practice of only taking one analysis from a run of 24 hours when a furnace is on foundry iron and then let that one determination stand for the chemical properties of the four or five "casts" which the furnace has made that day. It is not to be understood that all furnaces follow this practice, nor is the writer aware that it obtains any more in the South than in the North, but he does know that such practice should not be tolerated by any furnace claiming to grade iron by analysis, and is little better than trying to achieve desired results in remelting, by judging the "grade" of pig iron by its fracture or grain. Every furnace "cast" should be analyzed and the metal of each cast kept separate by itself, when piled in the yard or shipped on cars, so that when the founder receives the iron he has not a chemical guess, but a positive fact to guide him aright in remelting his pig iron.

The second evil that exists is the inattention which furnacemen generally pay to thoroughly mixing a "cast." The general practice is for a furnace to take samples from each end and the middle of a cast to obtain the analysis which is to define the chemical properties of the whole cast and which is intended to guide the founder in making his mixtures. In a paper which the writer presented to the Foundrymen's Association at Philadelphia, Dec. 4. 1895, treating the question of "Segregation of Cast Iron at the Furnace and Foundry," it was clearly shown how one end of a furnace cast can differ all of one per cent in silicon from the other end, and also that the sulphur can vary greatly in the two ends of a cast. The founder receiving one analysis from such a cast, if the iron had not been thoroughly mixed, could be deceived one-half of one per cent in silicon and several points in sulphur. It cannot but be evident that such a practice gives the founder reasons for complaining of irregularity in the grade of irons which he receives from a furnace.

The adoption of chemistry about two years ago by the founder, was one reform that has gone a great way toward assisting him in having assurance of obtaining desired mixtures of iron, but another step is now required and that is for the founders to encourage blast furnacemen to devise systems for the thorough mixing of a cast as the iron is being removed from the casting house to be piled in the yard or loaded for shipment. This last reform is as essential as was the first one, before the progressive founder can conclude that the best that modern advancement can insure to him has been put into practice. A founder has good reasons for using all the precautions he can to obtain desired mixtures, as much as the steel maker finds the utmost precision necessary to success in obtaining desired physical properties in his product. There is often much that the founder is compelled to grope in the dark about and it behooves him to take as few chances as possible and know if he can, that each element is within itself correct. An ill-mixed cast of pig metal is liable to leave the founder perfectly defenceless in working, and adds an additional element to befog and sidetrack him in determining what was the cause of his failure to obtain the mixtures which he had felt so confident of securing. Removing this uncercertainty and the founder has one less evil to contend with and is placed so much nearer to the goal which many are striving to reach.

As to the question of furnaces furnishing Bessemer to fill orders for foundry iron, the writer fails to perceive how such can be done with a view of its being a cheaper iron. If Bessemer exceeds .10 in phosphorus it is then an "off Bessemer," and except with basic process is not acceptable for steel making. In such cases, it may be shipped for foundry iron and for some classes of work, would make excellent castings. The trouble and loss the founder may often experience in using regular or "off Bessemer," lies in its dullness or short life, caused by the phosphorus being so much lower in Bessemer than foundry iron. For this reason a furnace should be very careful when shipping any Bessemer to fill foundry orders to mention the exact analysis of the iron, especially its phosphorus contents and then, if the founder accepts it, the furnaceman should be relieved of all further responsibility. Silicon is not the only metalloid to be considered in making mixtures of iron. There is not one but has its influence to more or less change the character of iron and the founder who would figure closely on mixtures, must not ignore the effect each metalloid has in changing the character of iron.

Oral Discussion.

Mr. Bailey: I can say that I have noticed some little irregularity, but I do not always blame it on the iron. I think the coke has a great deal to do with it. A mixture will be running on all right for two or three weeks, and then we will get a new lot of coke and the iron seems all wrong. I often find by looking into the matter that the coke is at fault, or sometimes we get a poor lot of iron.

Mr. Stantial: During the last year I have noticed a great deal of irregularity in both Northern and Southern irons, but I think it is simply on account of the furnaces being off, and we are unable to get the iron we contracted for. I think with the Southern irons the irregularity was on account of the furnaces being pressed for shipments. When we have called for shipments on contracts, they have shipped us off grades simply because they did not have anything else in the yards. I think that the charcoal furnaces are getting down to science by employing chemists and knowing just what kind of iron they are making. With some of the charcoal iron that we call bankrupt stock the grading is very poor, indeed. That is to be expected of furnaces that are out of blast and are shipping their stock that has been laid aside while they were running. They sell the iron at a reduced figure and one has to take what they have. It does not represent what the furnaces should or could make.

Mr. Sercomb: If there were any irregularities you would not attribute them to the desire on the part of the furnaces to supply their Bessemer at the expense of the foundry trade?

Mr. Stantial: I do not think that has anything to do with it. In my own case I always look out for the Bessemer iron

when it comes in. I usually save considerable by putting the Bessemer iron to uses to which I could not put the foundry iron to.

Mr. Carver: I think there is a great deal of truth in what Mr. West says in that you must place more dependence upon the chemical analysis of the iron than on the fracture. I remember when I knew less than I do now about iron, I complained a good deal to the shippers about the quality of iron they were sending me. They said, You cannot tell by the fracture. I found that to be so frequently the case that I gave up in disgust trying to determine the quality of the iron by the fracture, and, instead, found out its chemical constituents. By taking both of these into consideration—the fracture as an indication of the chemical constituents—you can obtain pretty good results. A safer plan by far is the one we have adopted in our work, that of obtaining from each furnace a fairly correct analysis of each shipment of iron as it comes in. So far as the variation in iron is concerned, I am not prepared to say. On the whole, judging from the fracture, I should not say there was as much variation as there was four or five years ago.

Mr. Sorge: I heartily agree with what Mr. Carver states. In my experience I have not seen any greater variation in the iron of late than of years past. I think an explanation of the matter is that we are making greater demands on the furnaces than we were some years ago. Then we judged by the fracture, while to-day we are not taking that as a final criterion, but are taking the actual chemical constituents of the iron. I have found, as Mr. Carver states, that the practice of demanding an analysis with each car serves very well to check irregularities in shipments. I would like to state with reference to Mr. West's paper that where a cast is to be analyzed I think it should be demanded that the first, middle and last portion of the cast be analyzed. There is frequently a great variation in the two ends of a cast. I do not think there is a greater variation to-day than for years past in iron.

Mr. Cobb: The question seems to be as to the variation between the Northern and Southern irons. The remarks would indicate that there is a variation in both as to grading. All I can say about our own product is that we do not depend upon two determinations from each cast; we take four from each cast. Each cast is marked. We know from the number of the cast the chemical analysis of that cast. When we have demands for certain irons we can furnish them. The South to-day is producing an iron equal in every respect, as far as they can produce it, to that of any section. As far as irregularity in grading is concerned, that is practically out of the question. Fracture counts for something, but not everything.

Mr. Bailey: In taking the different analyses, it appears that the manufacturer admits a variation in the different portions of the cast. I would like to know what causes this variation. Even in two test bars made from the same metal we cannot get the same results.

Mr. Thompson: It seems to me it would be hard to get anything but a repetition of what has already been said in regard to this question. It is generally conceded that an open iron will make a soft casting, but I have not found that always to be the case. We have used open iron and turned out hard castings and found on examination that the coke caused the trouble. I had a case only the other day where the castings were coming hard, when they required nearly twice as long to turn up as they had previously. I changed the coke immediately and used the same iron and the result was satisfactory. The pig iron salesmen tell us, when we complain about the iron being too close, that it is a soft iron but is higher in silicon; and when I have complained about the grading of the iron being too close for No. 1 iron, I have been told to use it and it would be all right. And I have found it so. I do not think the foundrymen can depend altogether on fracture, and it seems to me it would be difficult for the furnacemen to furnish the foundrymen with just what analyses they might want. They can give them the nearest they can get to it. I think it is a hard matter for the ordinary foundryman to decide for himself.

Mr. Sorge: Mr. Cobb has told us that the Sloss people take four analyses. I presume one at the beginning, one at the end and two in the middle. I would like to know wha analysis it is that they furnish us when we ask for the analysis of a carload. I know there is a possible variation of one per cent in silicon. Which analysis do they furnish us?

Mr. Cobb: We will furnish you the first, second, third or fourth, whichever comes nearest your demands.

Mr. Sorge: Then when you ship a carload, do you know which analysis that carload comes from?

Mr. Cobb: Most decidedly so.

Mr. Carver: My experience has been that we have done some kicking and have laid ourselves open to be criticised. When we have insisted on prompt shipments of iron the furnace men have said that they were unable to furnish us within one-fourth per cent of the silicon we would want. A short time ago they had the iron in stock, but now they cannot furnish just what we want. That has been their frequent excuse. I want to know whether they average the four analyses in the cast and called that the analysis.

Mr. Cobb: You understand in making a cast of pig iron it runs longer than the length of this room. The first part of it is cast in molds and we take an analysis of that, and so on. The iron is all marked, and when a carload is sent out we can give the analysis of it. We can give within one-fourth of one per cent in silicon, and therefore we have no trouble.

Mr. Salomon: In our experience we have noticed at times in the fracture of the iron that the Northern iron is usually better than the grade. We get No. 1 foundry when we ask and pay for No. 2. In Southern iron we have found that it is not up to the standard. The grade of one car of iron would be lower than the grade of another. We have investigated and found on complaint that the reason was on account of an off cast or poor management at the furnace. Otherwise our grade of iron has been coming very nicely.

Mr. Sercomb: I would attribute it often to the foundryman himself. In changing the fuel we sometimes experience trouble. Not long ago our iron hardened and we went to the coke bed. We had orders in for several cars of coke and some of it had come. We examined the coke and changed on to another car and our trouble disappeared. The first of last year when the demand for iron came, the iron men could not always give us what was required, and the iron was not graded as closely as it should have been. I am willing to attribute the greater portion of the blame to the foundryman himself. There are very few foundrymen that can afford a chemist. I know that we cannot afford to employ a chemist. It costs to keep up a laboratory. We rely largely on the furnaces.

Mr. Cobb: A great deal has been said about the furnace men furnishing a lower grade of iron than they sold. I think where you found that to be the case it was due to some scalper or broker. I do not think the producer of iron would give a lower grade for a higher.

Mr. Sercomb: I think that possibly the demand exceeded the supply and the foundryman must have the iron and he probably told the producer to send it on. I do not think it was a matter of dishonesty on the part of the furnaceman in sending possibly a lower grade. I did not intend my remarks in that way.

Mr. Vrooman: I would like to ask if it is not possible that some fuel will make a stronger fire than some other and burn out the silicon in the iron, while the latter takes up the sulphur?

Mr. Sorge: I do not think that explanation would be correct. The same quantity of coke, whether of one car or another, does not give a very largely varying amount of heat. I would not expect in a cupola that there would be the burning out, to any extent, of the silicon and carbon, because you have not a very intense blast, and, furthermore, your metal does not come into such direct contact with the air as would be required for burning out the metalloids.

It was moved that the next notice contain a request that each member should attend the National convention in Philadelphia, if it is a possible thing. The motion was carried and the Secretary instructed to include the request in the next notice to the members.

The meeting then adjourned until May 20.

W. P. SNYDER, of the well known iron and steel selling firm of W. P. Snyder & Co., Pittsburg, has purchased the interests of the Oliver Iron & Steel Co. and the Edith Furnace Co. in the Hainesworth Steel Co. The remaining interests are owned by Geo. T. and H. W. Oliver. The business will be carried on under the old name.

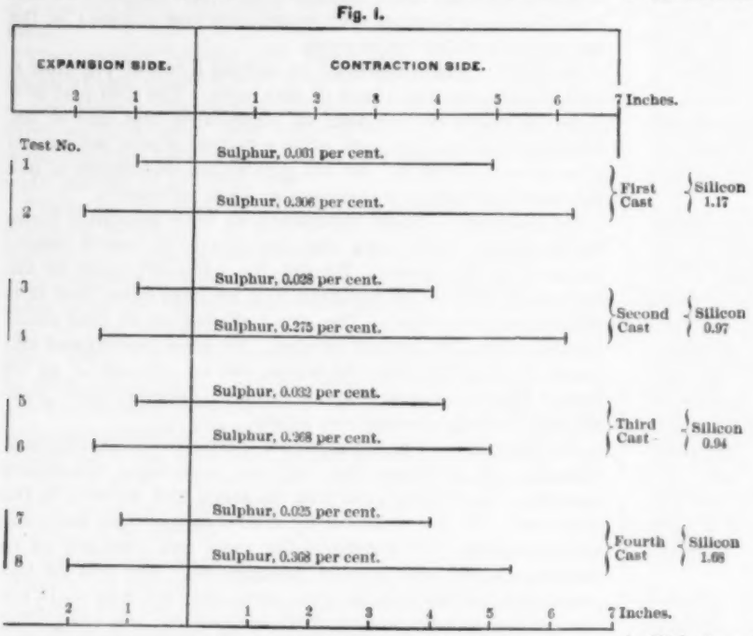
THE EFFECT OF EXPANSION OR SHRINKAGE AND CONTRACTION IN IRON CASTINGS.—II.*

BY THOMAS D. WEST.

[In the last issue of the *Iron Trade Review*, the bulk of Mr. West's paper was given, together with Figs. 1 and 2. The remainder is given herewith, together with illustrations of the apparatus employed in making the tests, whose results are plotted in Figs. 1 and 2.—ED]

The apparatus used for obtaining the expansion and contraction records, given in Figs. 1 and 2, is shown in Figs. 3, 4, 5 and 6. It was designed after much study of the conditions necessary for automatic record of the expansion and contraction of test-bars, and also for the highly important purpose of simultaneous comparative tests. The figures illustrating this apparatus (which is freely offered for use to all who may be interested in the matter) will be readily understood with the aid of the following explanation: In Figs. 3 and 4 the same letters indicate the same parts, namely: A, stationary or sliding recording face-plate board; B, float; D, float-receptacle; E, regulator, giving constant head of water; F, supporting arm for the water-supply vessel; H, over-flow wipe; K, L and M, recording-arm levers; N, lead-pencil recorder; O, rubber-band lever-supporter; R, curve-recording face-plate board; S, slide-guides for recording curves; T, revolving sheave-wheel guide and support; U, fulcrum cross-bar; Y, supporter of fulcrum cross bar.

Fig. 1.



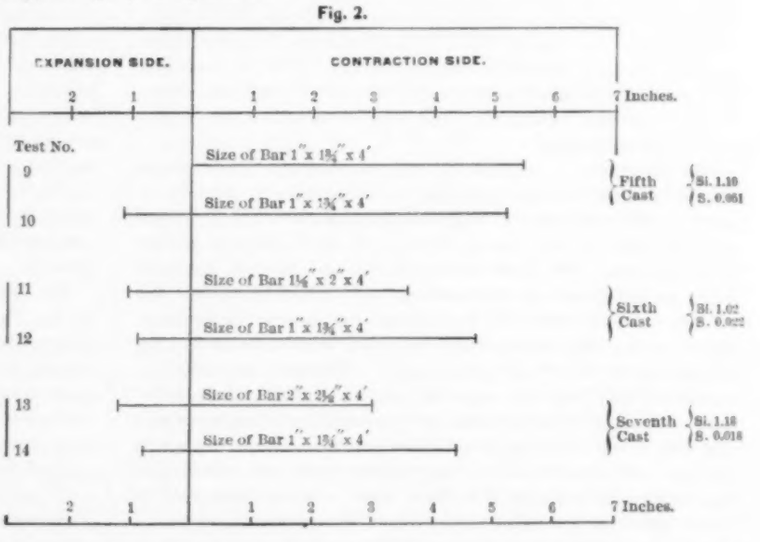
In Fig. 5 the parts are indicated by letters as follows: A, counterbalance clock-weight; B, bed-plate, securing the base-board; N, lead pencil recorder; I, one-day "Pirate" alarm-clock; R, curve-recording face-plate board; S, removable casting-pin; T, casting-pin; U, fulcrum cross-bar; V, clock and recording face-board connecting-shaft; W, casting-pin holder.

In Fig. 6 the parts are indicated by letters as follows: A, expansion and contraction end equalizer; B, spring-clasp; D, flow-off recess; E, spring-clasp iron; F, lever-fulcrum bearing; H, casting-pin clasp opening; K, removable casting-pin. The levers of this apparatus are so delicately mounted as to be moved by a breath. Those shown in Figure 6 are of improved form, as compared with those in Figure 5. As already stated, for every inch travel of the long arm, the short arm, moved by the actual expansion or contraction, travels $\frac{3}{32}$ inch in the straight line. The diagrams, Figures 1 and 2, were constructed by plotting the sum of the readings given by the pencils at the two ends of the apparatus in straight lines, and consequently give only the total longitudinal expansion and contraction, without indicating rate or alternations. But the apparatus can be employed, with the aid of the float or clock, etc., shown in the figures, to record curves. For a straight line record the face-plate, A, Figs. 3 and 4, is held stationary. To obtain curves, it is gradually lowered at any desired rate by means of the float, B, in the receptacle, D, Fig. 4, a constant head of water being maintained in the reservoir, E, by a supply from a suspended vessel at F, and an overflow-pipe, H. A specially-arranged strong-spring clock might be used instead of the float, B, to lower this face-board uniformly, so as to effect the same end. It is the writer's intention to make a series of experiments giving automatic curve-records, so as to introduce into the results the element of time. Incidentally, such experiments ought to settle the question whether there are, as has been declared, two periods of expansion for cast iron solidifying and cooling.

The lever-arms, K, L and M, Figs. 3 and 4, are held gently against the face-plate by light rubber bands, secured midway in their lengths at O, so that the very soft pencils at N may record all movements of these arms. The pencil record may be made on paper, covering the face-plate, as indicated in the figures, or on the bare face of the recording-board.

It will be evident that the records of the independent levers at each end of the bar must be added together, in order to determine the total expansion or contraction. Thus, in the case of Test No. 1, Fig. 1, the automatic record of the apparatus would show a travel in expansion of ½ an inch at each end, or one inch in all, followed by a contraction of 2½ inches at each end, or five inches in all. This travel of contraction includes the retracement of the previous expansion. In other words, after expansion was ended, the bar contracted longitudinally $\frac{1}{32}$ of an inch (each inch of the pencil-line representing $\frac{3}{32}$ inch of the short-arm lever movement, *i. e.*, of actual extension of the bar); and consequently, the test-bar, 48 inches long as poured, was elongated in solidification to $48\frac{1}{32}$ inches, and then contracted in cooling to $47\frac{29}{32}$ inches its final length at atmospheric temperature.

Fig. 2.


EXPANSION SIDE.
CONTRACTION SIDE.
2 1 1 2 3 4 5 6 7 Inches.
Test No.
9 Size of Bar 1" x 1⅝" x 4'
10 Size of Bar 1" x 1¾" x 4'
Fifth Cast
Si. 1.10
S. 0.061
11 Size of Bar 1⅛" x 2" x 4'
12 Size of Bar 1" x 1¾" x 4'
Sixth Cast
Si. 1.02
S. 0.022
13 Size of Bar 2" x 2⅛" x 4'
14 Size of Bar 1" x 1¾" x 4'
Seventh Cast
Si. 1.18
S. 0.018
2 1 1 2 3 4 5 6 7 Inches.

The clock shown at I, Fig. 5, with its face-plate R can be set independently, with a single recording lever, to receive on the revolving face expansion and contraction curves from one end of the bar only, or it can be supported, as shown in Figs. 3 and 4, so as to record curves in connection with the records made on the stationary or sliding face-board A.

The whole apparatus is of wood, except the fulcrum bars, U Figs. 3, 4 and 5, the casting pin S, Fig. 5, and the pin-holding plates E, Fig. 6. The form of levers shown in Fig. 6 is that which I have adopted since originally photographing the ap-

*Contributed to the discussion on Physics of Cast Iron, at the Pittsburg meeting of the American Institute of Mining Engineers, February, 1896.

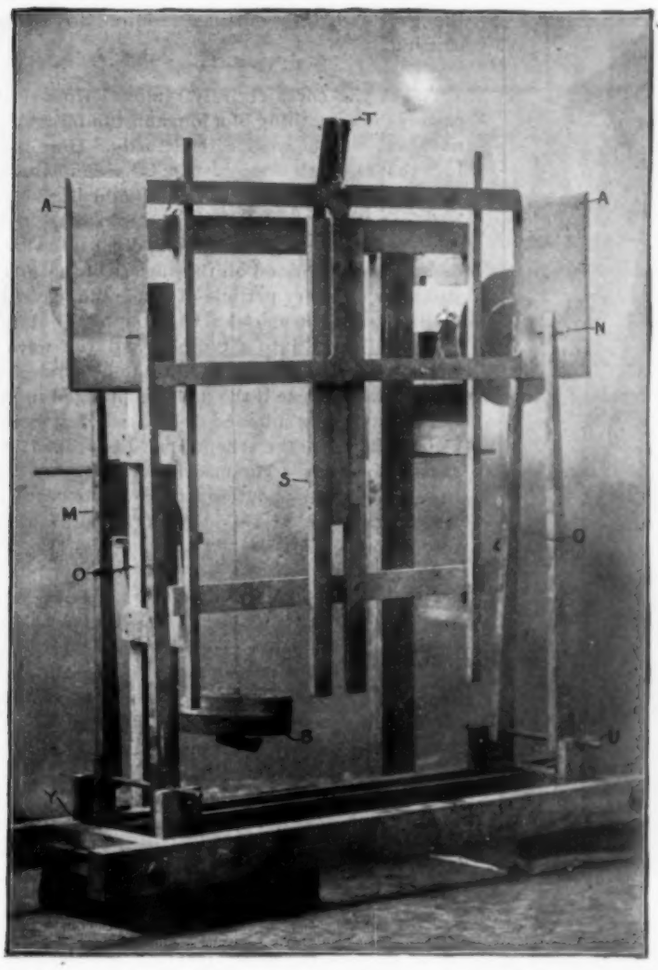


FIG. 3.

paratus for the preceding figures. From a study of these levers in Fig. 6 it will be seen that a little pressure on the spring side at B will instantly release the casting pin seen at K, thus meeting a difficulty sometimes experienced with the first form of grasp used, which is shown at W, Fig. 5. The ⅜-inch casting pins seen at S, Fig. 5, and in position at K, Fig. 6, are made tapering at their points, so that they can be readily moved from a test bar and used again. They project below the bottom of the spring clasp to about the distance indicated in Fig. 6, so as not to touch the bottom of the mold when being cast in the bar for the purpose of causing the levers to record sensitively any movements due to expansion or contraction after the bars are poured.

At the left of Fig. 6 is seen the form of pattern used for molding the test bars. The projection at A is cast on, as shown, so as to insure equal action in recording the expansion and contraction at each end of the bar. At D is seen a recess, which gives a guide to make the same in the mold, so that in pouring the bars "open-sand," the metal will "flow off" at this point when it comes to that level, and thereby insure all bars being cast closely to the same thickness.

Demolition of a Large Mill Chimney.

An interesting account is given in the *Engineer* of the demolition of a tall chimney stack at Manchester, Eng. The chimney was 270 feet in height; each of the eight sides of it were 11 ft. 4 in. wide. The chimney had a taper of ⅝ in. to the yard. The foundations were nearly 25 ft. deep, and over 1,100,000 brick were used in the construction of the chimney which was 28 years old. The estimated weight was 4,000 tons. The owners of the chimney having sold the property, it became necessary to remove it, and it was bought as old building material.

There was an inside brick lining to the chimney, and the inner and outer walls were tied together by eight midfeathers. There was a lean of over 2 ft., in a northerly direction; still it was not considered that it was unsafe. The purchasers of the chimney engaged an experienced rigger to raze it. He caused a portion of the base on five sides (east, south and west) to be cut away for 5 ft. 6 in. in height, and as the cutting away of the brick work proceeded, timber lintels or carriers were inserted, wedges being used to pack up the bricks, which was a difficult operation, considering that the thickness was 7 ft. 6 in. The timbers were perforated for the reception of resin and other inflammable substances to insure quick combustion. When this work was completed, the spaces between the uprights were filled with shavings, pieces of wood, coal tar, pitch, etc., and over this was poured a considerable quantity of creosote and paraffine oil. A light was applied to the inflammable material and large bodies of flame shot up and smoke poured out of the top of the chimney and from cracks in it. The fire continued with great fury and was fed in places where it was desired to more quickly destroy the timber, with paraffine oil. The stack leaned over to the south and had not gone far out of the perpendicular when the portion near the base dropped into itself, and the support being thus removed the remainder of the structure literally collapsed in telescopic form and fell in a southerly direction. The debris covered an area 75 ft. long by 40 ft. wide. The time occupied in the destruction of the timber supports, that is, the time of the lighting of the timber to the fall, was

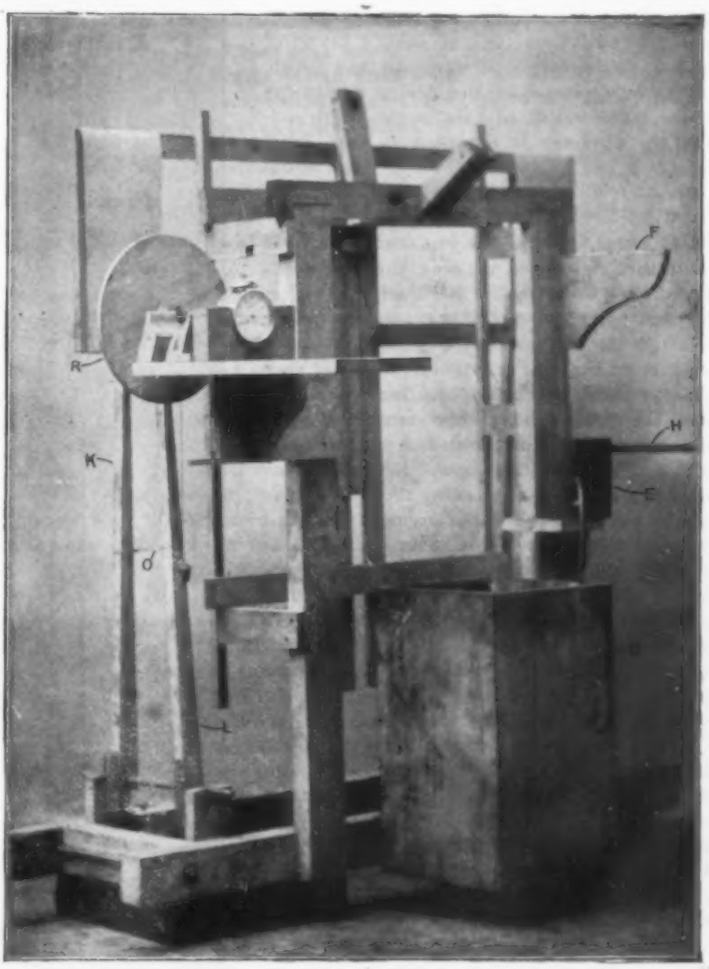


FIG. 4.—SEE PAGE 16.

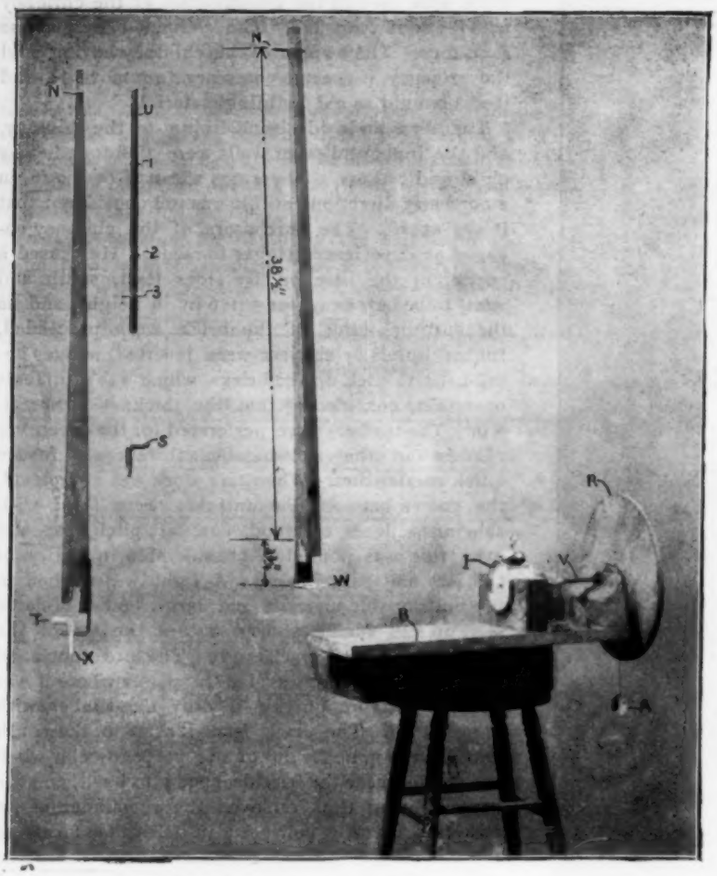


FIG. 5.—SEE PAGES 16 AND 17.

only seven minutes. Little noise was heard when the stack was falling, but a considerable shock was experienced when the heavy mass fell on the ground. Two tons of coal, a barrel of creosote, two barrels of paraffine oil and 350 cu. ft. of timber were used in the destruction of the chimney. The result of this method of demolishing the chimney is regarded as very satisfactory.

Shop Hints.

Has it never occurred to you that those tight belts on that high-speed molding machine needs a little relief occasionally. Of course, I understand that you are a careful man, and that when the belts were put on they were not stretched beyond their limit of elasticity, and that they would go back to their original lengths if they had but the chance, and if they are not given the chance they will by and by assume a permanent stretch and be just a little loose. Not really loose enough to warrant you in taking them up, but so that on a heavy cut the heads lag and you must stop the feed until they begin to sing in the upper notes again. This is annoying, and all the more so since the difficulty can be easily remedied. Simply slip them off the pulleys at night and give them a chance to recover their normal length, and you will have a belt that will have a constant tension every morning for years.

The same results can be obtained for the belt coming down from the shafting by having the loose pulley just enough smaller to take the strain off the belt and still keep it in position. On woodworking machinery like molding machines and surfacers, this can very readily be done, as it is customary to run them for a half day at a time; but on iron-working tools where there is a continual and repeated starting and stopping the "jump" pulley may not only not be a convenience but an absolute nuisance on account of the greater length of time required to do the shifting.

To get the cores entirely removed from small castings is something of a job, and tumbling does not always do the work satisfactorily. Here is an idea that is worth trying, as I have seen it worked successfully in one place. It should be added, however, that it is only applicable to brass. Before the casting is perfectly cold, dip it into water, and the steam formed on the surface of the metal will blow off every particle of sand and leave the casting as fresh and clean as though its interior had been made into a tumbler and run until it was worn bright. It will not do to be careless in the handling, since if the metal is plunged in too hot it is apt to be softened or cracked; but after a short experience the scheme can be worked as a great labor-saver. The man I saw using it would handle his pieces about as rapidly as the ordinary laborer could be prevailed upon to throw them into a tumbler.—[Dixie.

It has been found that the presence of a small quantity of aluminum in ordinary cast iron strengthens the material considerably. Its action is not clearly understood, but it is probable that the presence of this metal prevents blow holes by decomposing carbonic oxide at high temperatures. The gas which forms ordinary blow holes is supposed to be caused by the dispossession of graphite carbon which causes the carbon in the iron to become of the nature of graphite, instead of being combined in the proper manner. —[Chattanooga Tradesman.

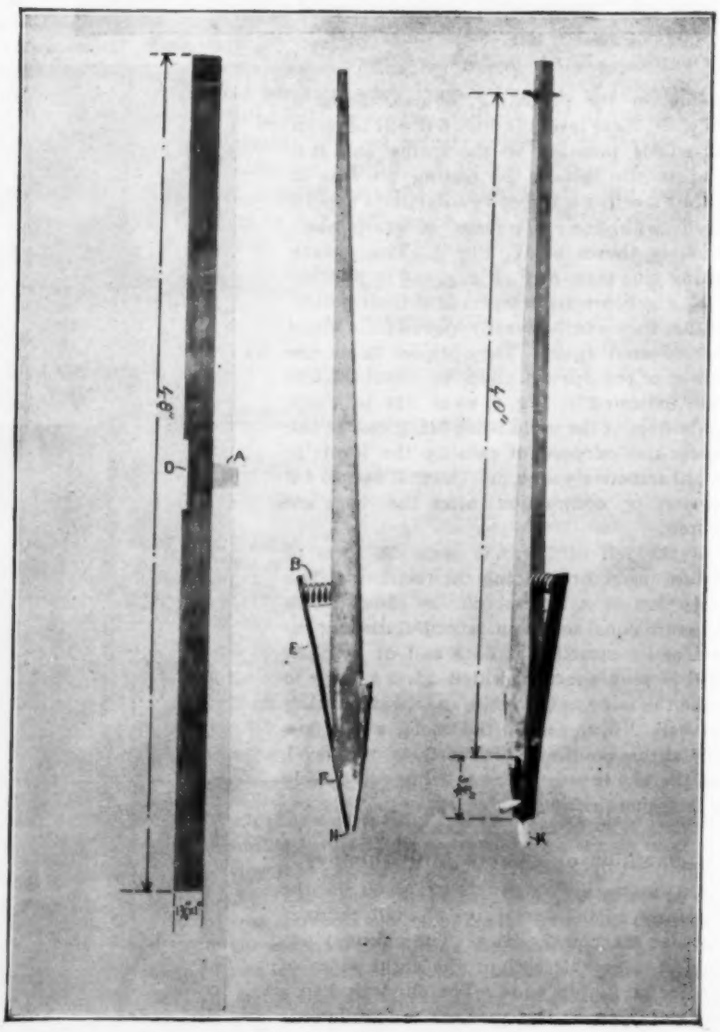


FIG. 6.—SEE PAGES 16 AND 17.

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Shenango Valley Steel Co.,
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Illinois Steel Co.,
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INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

P. Farwell, Frederick, Ill., wants to buy second-hand benching and forming machinery.

W. H. Grissom, 153 Lake st., Chicago, is in the market for a second-hand Corliss engine, 16 by 42.

The Detroit Iron & Wire Works, of Detroit, Mich., has been incorporated with a capital stock of $10,000.

"Gas Engine," 168 Lake st., Chicago, is in the market for a seven h. p. gas engine, either new or second-hand.

The Vestey Canning Co., 214 S. Clinton st., Chicago, will buy a good second-hand boiler, 40 to 60 h. p., to work at 60 lbs.

C. A. and M. A. Lowell, of Cortland, N. Y., have formed the Cortland Welding Compound Co., for the manufacture of several lines of welding compounds.

The Snow Locomotive Co. has been incorporated at Chicago, with a capital stock of $125,000, to manufacture traction engines, by Peter P. Wood, Charles A. Stroude and Arthur F. Durand.

J. E. H. I. Hospital, Kankakee, Ill., wants to buy a centrifugal pump, with steam engine attached, not less than six inch suction. State make, price and steam power necessary to operate.

The Utica Steam Engine & Boiler Co. has been incorporated at Utica, N. Y., with a capital stock of $50,000, divided into 500 shares, and the directors are: Joel A. Omans, Horatio S. Moore and John B. Jones. The company will operate the plant of the late Philo S. Curtis.

The Bellefonte Hammer & Tool Co., of Bellefonte, Pa., has been organized by J. P. Harris, Thos. A. Shoemaker, I. I. Montgomery, Harry Jenkins, E. L. Owis, Howard Lingle and Wm. R. Jenkins. It is intended to erect a plant at once for the manufacture of tools, hammers, etc.

The Department of Public Works, Cleveland, will receive bids until May 2 for the setting of four tubular boilers and equipping them with mechanical stokers; also for about 740 feet of 48-inch riveted steel water-pipe with cast iron chairs and steel suspension beams; steel pipe to be ⅝ inch thick, and include eight 45 degree bends.

New Construction:—

Ellwood City, Pa., will be the seat of the new tube mill to be erected by the Lozier Mfg. Co. The capacity will be nearly twice that of the present mill of the Lozier Mfg. Co. at Ellwood.

The Strange Forge Twist Drill Co., New Bedford, Mass., will erect a new plant, the main structure to be 40x130 feet. The forging room will be 42x60 feet and the boiler house 31x53.

The Strohl-McIntosh Co. will soon locate in Barberton, O., and three buildings will be erected—one 40x80 feet and two stories high, and two 40x60 feet each, one story. Saw mills and picket machinery and drills are the specialties of the company.

It is reported that the Cambria Iron Co. will spend a considerable amount in extension of its plant the coming year. In the Gautier department a new mill will be erected to connect with the 24-inch mill. Changes will be made in the old rail mill and in the old steel works.

The Berlin Iron Bridge Co., of East Berlin, Conn., has the contract to furnish the New Britain Knitting Co., the steel works, for its new boiler plant. The roofs of the buildings will have steel trusses throughout, and the designs call for such construction as will render them thoroughly fire-proof.

The erection of new machine and wheel shops of the Atchison, Topeka & Santa Fe, at Argentine, Kan., will be commenced soon. The new shops will be about 80x200 feet. Considerable new machinery will be ordered for these shops, including a wheel-boring machine, axle lathe, wheel press and wood working machinery.

Additions, Enlargements, Removals, Etc.:—

Baker & Shevlin, foundrymen and machinists, of Saratoga Springs, N. Y., will build a large addition. Part of it will be

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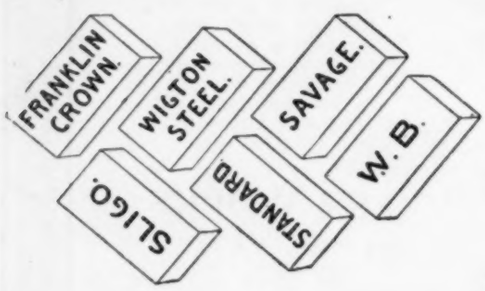

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is an increasingly valuable medium through which to sell equipment to machine shops and foundries.

equipped as a brass foundry and five new brass furnaces will be erected.

D. T. Lane & Son, of Franklin, Pa., will build a larger machine and blacksmith shop. The ground has been purchased and operations will be begun at once.

The Chattanooga Foundry & Pipe Works, of Chattanooga, Tenn., will build a new plant. The foundry building will be 110x360 feet, two stories, and it is stated that the cost will probably reach $100,000.

The additions to the plant of the New Castle (Pa.) Tube Co. are 130 feet and 108 feet, one at each end of the present main building. They will increase the output to from 12,000,000 to 15,000,000 feet a year.

The Westinghouse Machine Co. has started the erection of a big addition to its foundry department at Wilmerding, Pa. It will be of iron, 60x500 feet. More accommodations are needed for the increased work of the foundry. The addition will be completed in June.

The Philadelphia Machine Tool Co., Philadelphia, recently incorporated, moved into its new quarters at 445 Garden st., in that city about the beginning of the year, since which time it has completed the erection of new machinery and is fully operating the greatly enlarged plant. The company practically, is successor to the business of the Henderson Machine Tool Co., which went out of business about two years ago. The president of the old concern is president of the new company, and Geo. M. Sinclair is secretary and treasurer. Mr. Henderson took from the Henderson Machine Tool Co. much of its machinery and patterns, and the new company will continue to build a full line of machinery for working sheet metals, covering presses of all kinds, including standard fly wheel and geared punching and stamping presses, drawing presses, steel ceiling presses, embossing presses, shears, riveters, plate straightening machines and special machinery.

Fires and Accidents:—

At Toledo, O., an explosion of gasoline fired the Dauntless bicycle factory and it was entirely destroyed. Loss is close to $100,000, nearly covered by insurance. Fire communicated to the Toledo Machine Tool Co.'s works and valuable patterns were destroyed with a loss of upwards of $20,000; insured.

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1—55″ Allen Riveter.
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1—10″x5′ Prentice Engine Lathe.
1 each 14″ and 15″x6′ Ames Engine Lathe.
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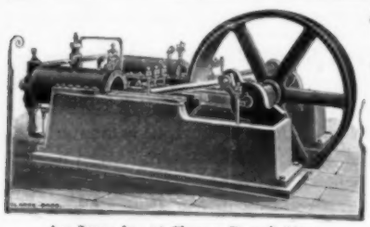

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Experts pronounce this invention most valuable, furnishing an inexpensive method for utilizing the soft and waste ores and thus reclaiming a large percentage of the most superior minerals.

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OFFICE, 525 ROOKERY, CHICAGO.

General Industrial Notes:—

The new puddle mill at the Olney street plant of the Reading Iron Co. has gone into operation.

The Finished Steel Co., of Youngstown, O., is running steadily. A new stock house is being erected.

At Ironton, O., the work of rebuilding Ætna furnaces is going on rapidly. Three stoves are to be built.

At the McVay & Walker foundry, Braddock, Pa., the molders are on a strike for $3 a day, an advance of 50 cents.

Swede Furnace No. 1, of R. Heckscher & Sons, at Swedeland, Pa., has blown out. It will be remodeled to the lines of No. 2.

The Wemple foundry, at Fultonville, N. Y., has been purchased and will be rebuilt and operated by the National Fencing Co.

The Wheatland blast furnaces, at Wheatland, Pa., which were erected in 1862, but have been idle for more than 20 years are being dismantled.

In connection with its great plant at Duquesne, the Carnegie Steel Co. will install a complete electric light and power plant. A coffer dam has been built in the Monongahela river and water will be pumped to a stand pipe 160 feet high and 16 feet in diameter. The pumping plant will be electrically operated.

The extensive plant of the Oxford Iron & Nail Co., Oxford, N. J., has been sold to E. R. Holden, vice-president of the Delaware, Lackawanna & Western Railroad, for $70,000.

W. J. Clark & Co., of Salem, O., have rebuilt their works, destroyed by fire in September. The new plant is one of the largest in the country for the manufacture of elevator buckets.

The Pekor Iron Works, of Columbus, O., have begun operation in several departments. The foundry has not yet been completed, but the machine shop is ready and the engines have been tested.

Little Giant Furnace in Allegheny, Pa., owned by Neal Brothers, Pittsburg, has been abandoned and will shortly be dismantled. The furnace is a small one, being 40x6 feet, and had an annual capacity of 12,000 gross tons of white and mottled pig iron.

Car and locomotive building: It is reported that the Baldwin Locomotive Works have received an additional order for 60 locomotives from Russia. In addition to the 1,000-car order given by the Lehigh Valley Railroad to the Michigan-Peninsular Car Co., is a contract for 100 hopper bottom cars from

the Pennsylvania Co. to the Wells-French Co., Chicago, and a contract for combination refrigerating and freight cars, given by the Seaboard Air Line.

John Pew, of the Youngstown (O.) Iron & Steel Roofing Co., and Charles E. Fowler, chief engineer of the Youngstown Bridge Co., recently secured a patent on a bridge floor. It is a corrugated arch with cement filling, and is well thought of by bridge experts.

The new Pioneer Furnace at Gladstone, Mich., was put in blast Thursday, April 16. Nearly a month ago the work of starting began, a few charcoal kilns being fired at first, then others, and later the chemical works were put in operation. Every portion of the plant is now going.

The best record for production of ingots at Edgar Thomson Steel works in 12 hours was broken recently. In the 12 hours from Sunday night at 6 o'clock until 6 o'clock the next morning there were turned out 69 heats, there being 1,190 tons of ingots. The largest previous record in 12 hours was 78 heats aggregating 1,146 tons of ingots.

The St. Louis Bay and the Ironton land companies have brought suit at Duluth for $125,000 and $100,000 respectively against the Ironton Structural Steel Co. and James E. York. They ask for the cancellation of deeds to property which they claim to be worth $80,000, on which is located the works of the deficient company. These companies claim to have paid the sums they sue for in 1890 as a bonus for the establishment of the steel plant at Ironton, a suburb of Duluth, on condition that it be in running order and employing 500 men in 1892. The new universal mill patented by James E. York was to be used. Various changes have been made and more time than expected has been required to perfect the invention. The structural steel company was to furnish $125,000 for construction work and working capital of not less than $50,000. Latterly the company has been arranging for more equipment and has started on a 30 ton open-hearth furnace and a blooming mill. The petition alleges that it has failed to carry out its part of the agreement.

The affinity of soft flake graphite for iron and steel makes it specially desirable for bicycle chains and sprockets. The Dixon Crucible Co., Jersey City, N. J., selects its material from unlimited stocks. After analyzing all other cycle chain lubricants in the market that it could find, it offers Dixon's No. 691 cycle chain graphite as unexcelled for preventing rust and wear of chain and for insuring ease and comfort in riding. Tom W. Winder, who rode 21,000 miles around the borders of the United States, says: "It saved me much hard work, as its application never failed to cause an easy running chain." No. 691 is the improved shape, and fits the tool-bag easily. Dealers will receive a sample free of charge by sending their business card.

THE Detroit & Cleveland Steam Navigation Co.'s steamers are now running daily (except Sunday) between Detroit and Cleveland. When traveling east or west, north or south, try to arrange to take advantage of these luxurious steamers between Michigan and Ohio. If you are contemplating a summer outing, write A. A. Schantz, G. P. A, Detroit, Mich., for illustrated pamphlet which gives full information of a trip to Mackinac via the Coast Line.

Steam Yachts and Marine Machinery,

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*

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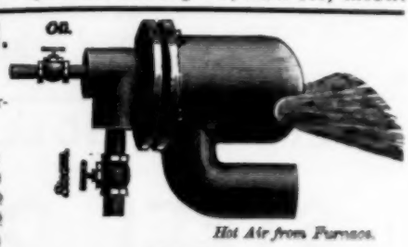

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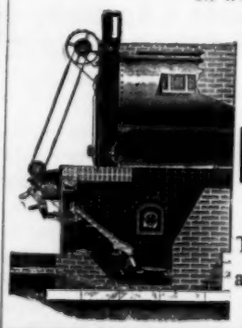

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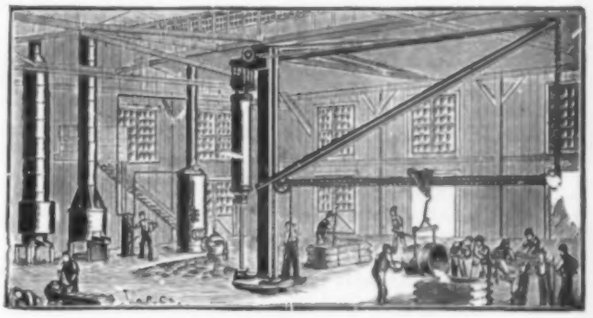
Went to all the great expense of the runway, etc., and got that traveller which cost you $6,000 and find you can't get your work out because the traveller can't be at both ends of the shop at once. The molders can't wait like the machinists and do something else till the crane comes, and here you must go to work and spend another $6,000 for another traveller. O dear! And $6,000 bills are not sticking around any too plenty. Takes lots of hustling to get $6,000 now 'days.

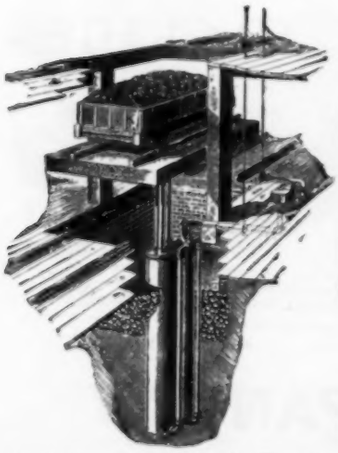


5-ton Steam-Hydraulic Crane in a Foundry.

Well, don't cry. No use crying over spilled milk. You are not so awful bad as far as you've gone. Don't go any further. Get a Ridgway Crane or two and stick along the runway. They needn't be very big ones, 5 tons will do seeing you already have the traveller for heavy lifting. These RIDGWAY CRANES don't cost much and you can do your molding of particular work under them. They will put up the work for you fast and insure it good when poured. Traveller can be a handy fellow of all work wherever needed. It was a pity you wasted that $6,000, but you need not waste another. You thought a foundry was like a machine shop, but it isn't.

Or, if you already have the two travellers, then get a RIDGWAY CRANE and stick it in some corner. If the note you gave to pay for the traveller is a long-time one, or you can get it renewed by paying a little on it, the RIDGWAY CRANE in the corner will in all likelihood save enough money for you to pay it when due.

It's a great Money Maker in a Foundry, this Ridgway Crane.



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Take the Elevator.

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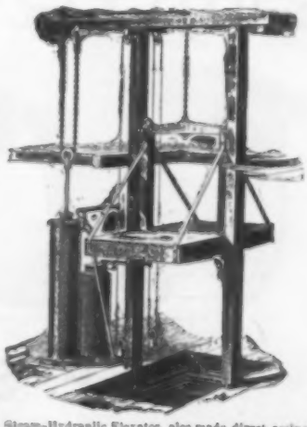

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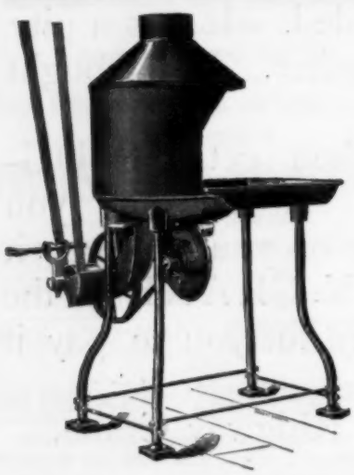

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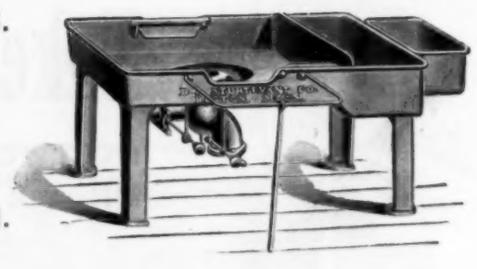

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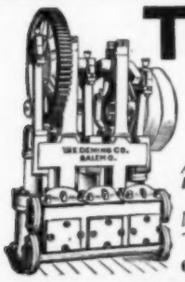

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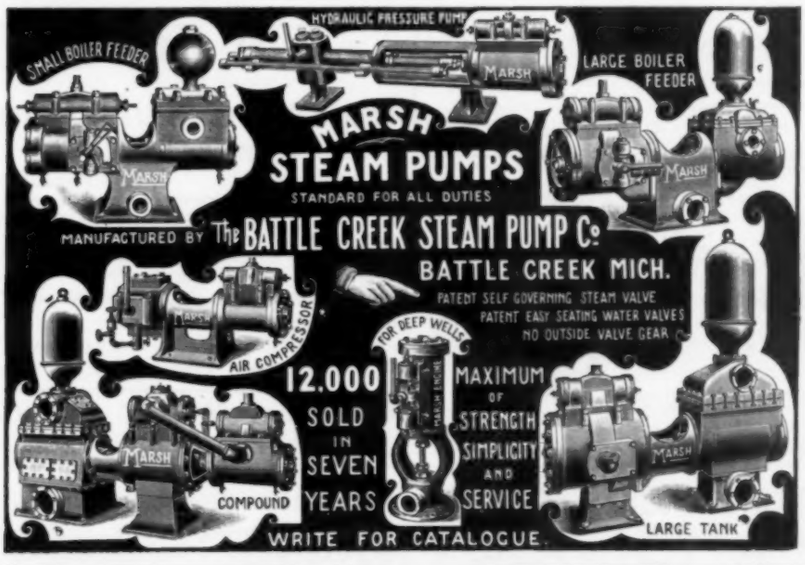

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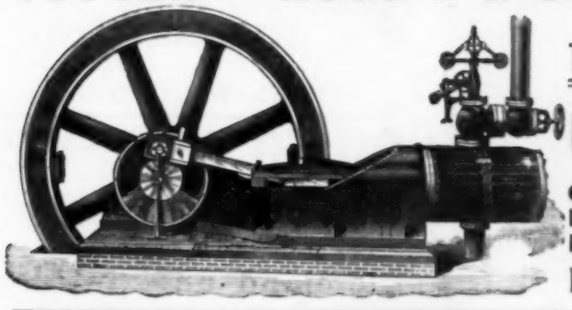

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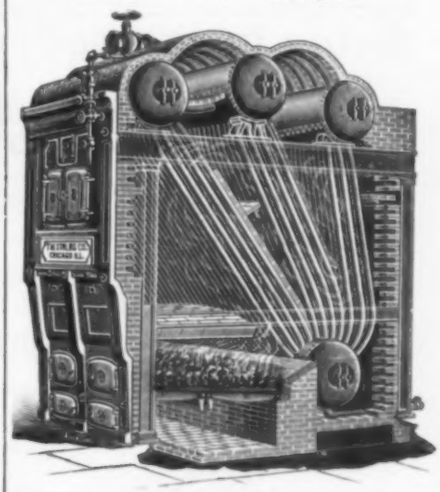

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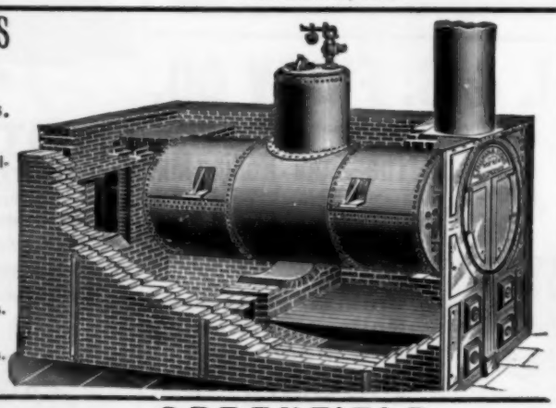

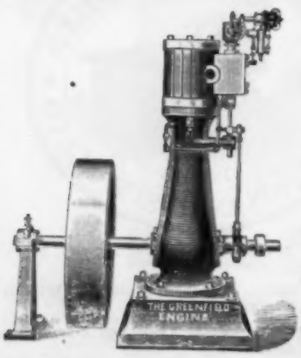

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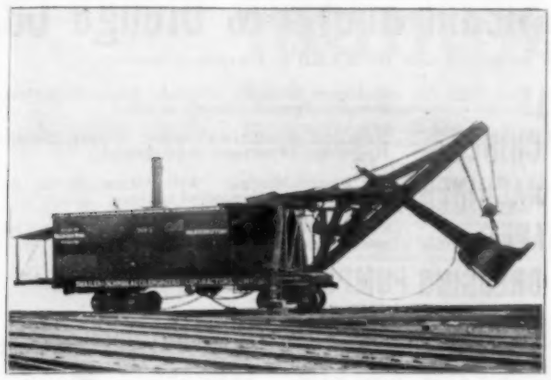

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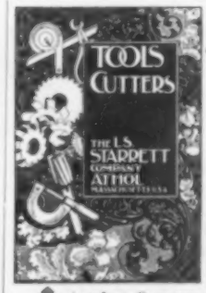

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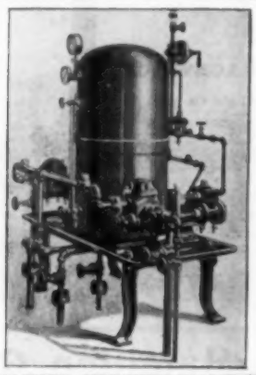

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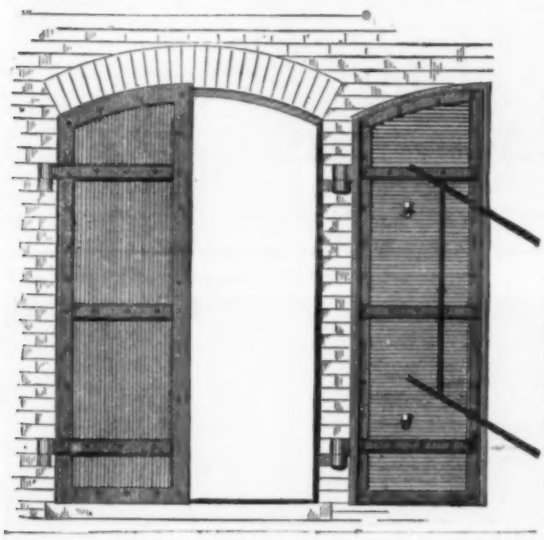

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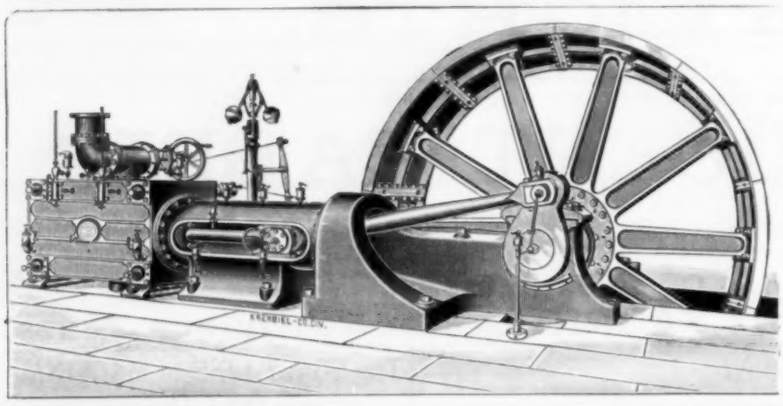

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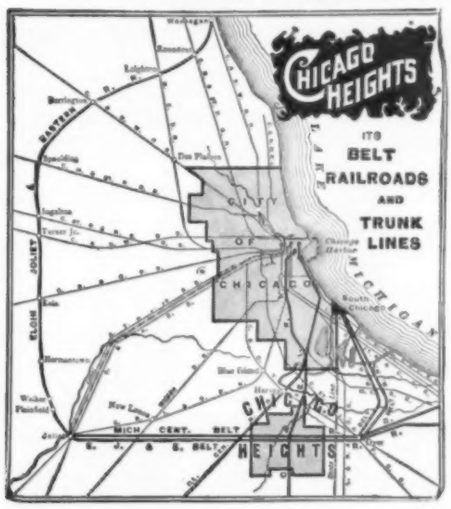

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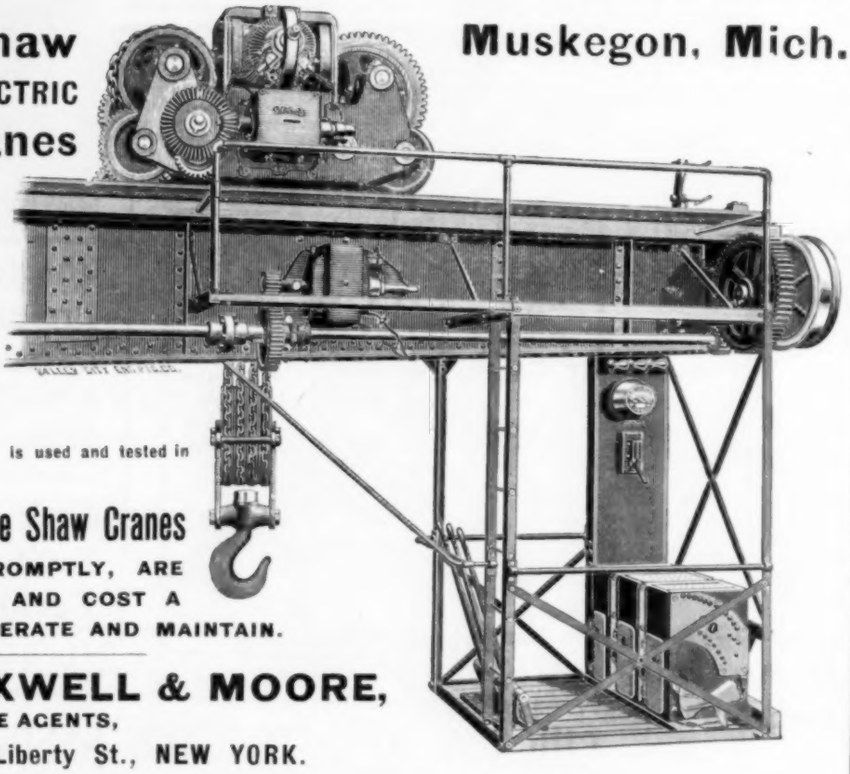

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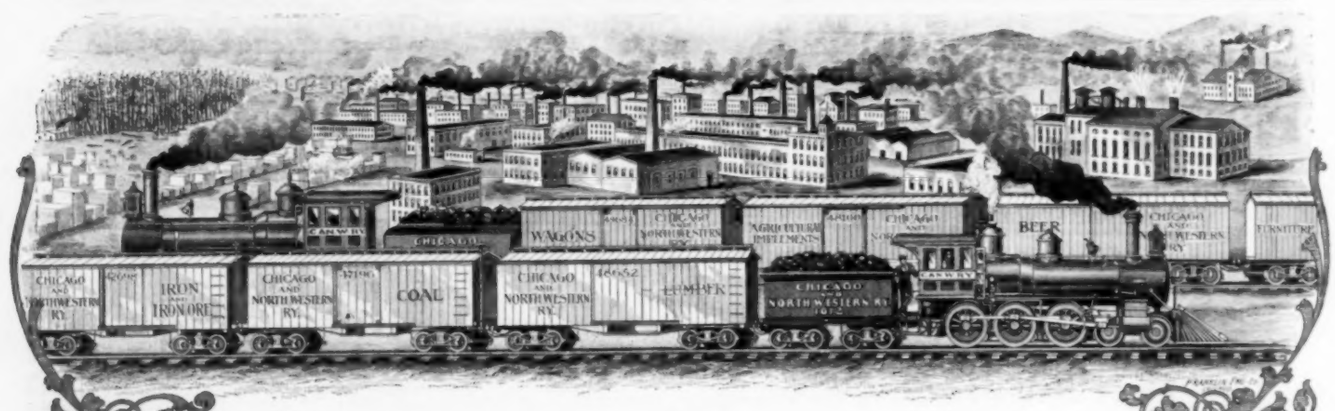

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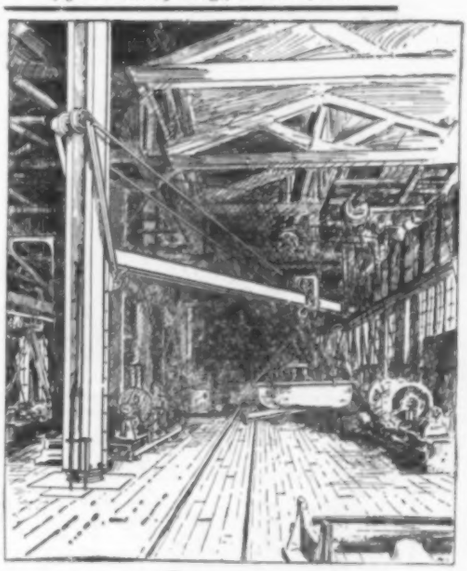

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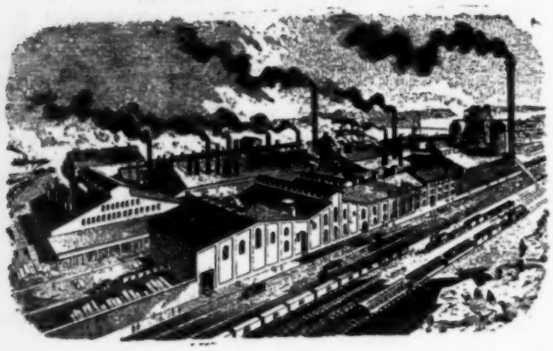

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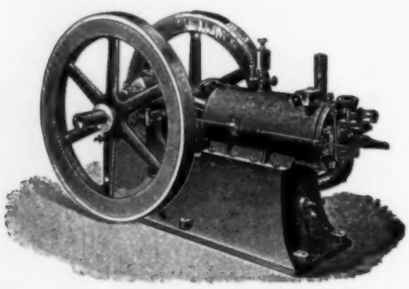

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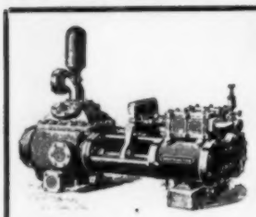

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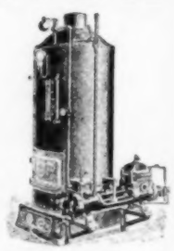

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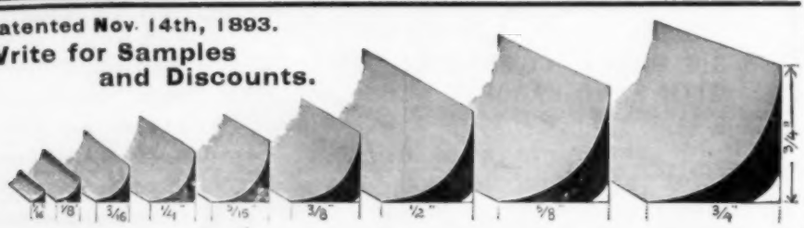

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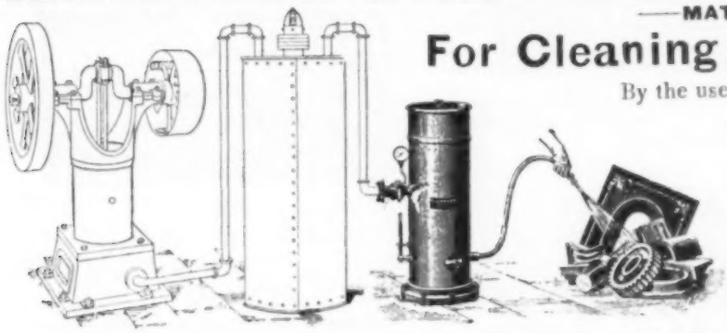

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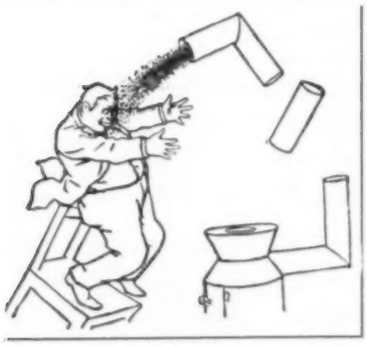

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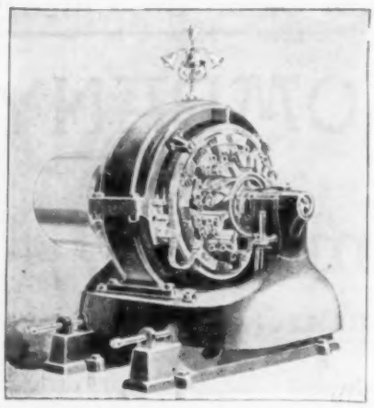

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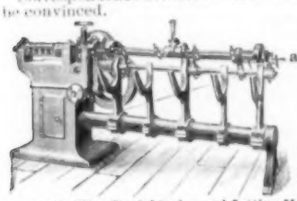

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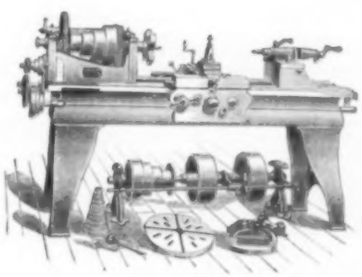

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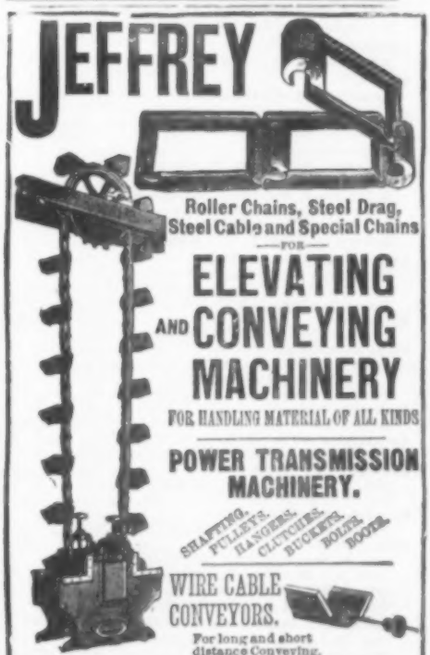

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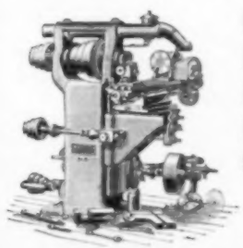

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Harrison Safety Boiler Works, Philadelphia.

Heating and Ventilating Apparatus—
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

Heavy Hardware—
E. K. Morris & Co., Cincinnati, O.
C. H. Besly & Co., Chicago, Ill.

Hoisting and Conveying Machinery—
American Hoist & Derrick Co., St. Paul, Minn.
Willis Shaw, 416 N. Y. Life Bldg., Chicago.
Link Belt Machine Co., Chicago, Ill.

Hoisting Blocks—
Moore Mfg. & Foundry Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn.

Hoisting Engines—
Vulcan Iron Works Co., Toledo, O.
The Edward P. Allis Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn
Willis Shaw, 416 N. Y. Life Bldg., Chicago.
Earle C. Bacon, New York City.

Injectors—
C. H. Besly & Co., Chicago, Ill.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.
Berlin Iron Bridge Co., East Berlin, Conn.

Iron Nails and Steel—
Weber & Co., Cincinnati, O.
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
Cambria Iron Co., Johnstown, Pa.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Willis Shaw, 416 N. Y. Life Bldg., Chicago.
Wm. B. Scaife & Sons, Pittsburg, Pa.
Ætna-Standard Iron & Steel Co, Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.

Iron Ore, Bar and Pig Iron—
Pittsburg Steel & Iron Mfg. Co., Pittsburg, Pa.
Oglebay, Norton & Co., Cleveland.
Condit-Fuller Co., Cleveland.
E. C. Pope, Cleveland.
Forster, Waterbury & Co., Chicago, Ill.
Central Iron & Steel Co., Brazil, Ind.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.
Cambria Iron Co., Johnstown, Pa.

Iron Shutters and Doors—
The Cincinnati Corrugating Co., Piqua, O.

Iron Working Tools—
Prentiss Tool & Supply Co., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, O.
H. Bickford, Lakeport, N. H
Davis & Egan Machine Tool Co., Cincinnati, O.
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Willis Shaw, 416 N. Y. Life Bldg., Chicago.
John Adt & Son, New Haven, Conn.
Diamond Machine Co., Providence, R. I.
U. Baird Machinery Co., Pittsburg, Pa.
The Wright Co., Lowell, Mass.
C. H. Haeseler & Co., Philadelphia, Pa.
The L. S. Starrett Co., Athol, Mass.
Skinner Chuck Co., New Britain, Conn.
Springfield Machine Tool Co., Springfield, O.
Harvey Hubbell, Bridgeport, Conn.

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY,

PITTSBURG, PA.

The Largest and Most Completely Equipped Electrical Manufacturing Establishment in the World.

POWER, INCANDESCENT AND ARC LIGHTING, FROM THE SAME CIRCUITS.

We have purchased and are the **sole owners** of the patents issued to Nikola Tesla for the **Polyphase Alternating System**, now recognized to be the most successful system for lighting and power purposes.

We furnish complete lines of apparatus for the perfect equipment of **isolated plants** for Hotels, Office Buildings, Flats and Factories.

STANDARD SYSTEMS

For distribution of lights and power in large **Manufacturing Establishments, Mills and Mines.**

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The most durable, economical and efficient on the market.

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BUFFALO, Erie County Bank Building.
PHILADELPHIA, Girard Building.
ST. LOUIS, American Central Building.
CHARLOTTE, N. C., 35-38 College St.
SYRACUSE, N. Y., Bastable Building.
SAN FRANCISCO, Mills Building.
WASHINGTON, D. C., 1333 F. St. N.
AHEARN & SOPER, OTTAWA, CANADA.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co. Chicago, Ill.

Lathes—
Prentiss Tool & Supply Co., Chicago, Ill.
Davis & Egan Machine Tool Co., Cincinnati, O.
Lodge & Shipley Machine Tool Co., Cincinnati
U. Baird Machinery Co., Pittsburg, Pa.
The Wright Co., Lowell, Mass.
Springfield Machine Tool Co., Springfield, O.

Machinists' Tools and Supplies—
Prentiss Tool & Supply Co., Chicago, Ill.
H. Bickford, Lakeport, N. H.
Davis & Egan Machine Tool Co., Cincinnati, O.
C. H. Besly & Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
U. Baird Machinery Co., Pittsburg, Pa.
The L. S. Starrett Co., Athol, Mass.
Skinner Chuck Co., New Britain, Conn.
Bertsch & Co., Cambridge City, Ind.
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Haeseler & Co., Philadelphia, Pa.
Springfield Machine Tool Co., Springfield, O.

Machine Screws—
Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
Hamilton Fdy. & Machine Co., Hamilton, O.
Springfield Machine Tool Co., Springfield, O.
Atwood & M'Caffrey, Pittsburg, Pa.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Manufacturers' Advertising—
United States Mailing Co., Cleveland, O.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metallic Lath—
The Cincinnati Corrugating Co., Piqua, O.

Metal Saws—
Q. & C. Co., Chicago, Ill.

Milling Machines—
Prentiss Tool & Supply Co., Chicago, Ill.
Davis & Egan Machine Tool Co., Cincinnati, O.
Lodge & Shipley Machine Tool Co., Cincinnati.

Mining Machinery—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn.
Link-Belt Machinery Co., Chicago, Ill.
Earle C. Bacon, New York City.

Mining Schools—
Michigan Mining School, Houghton, Mich.

Motors—
Westinghouse Electric & Mfg. Co., Pittsburg.
Franklin Electric Co., Miamisburg, O.

Molding Sand—
Ohio Sand Co., Conneaut, O.

Nickel—
Canadian CopperCo., Cleveland, O.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.

Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn.

Packing—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Paint—
Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.
Standard Paint Co., New York City.

Pattern Leather Fillet—
Canton Leather Fillet Co., Canton, O.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.

Planers—
Prentiss Tool & Supply Co., Chicago, Ill.
Davis & Egan Machine Tool Co., Cincinnati, O.
Lodge & Shipley Machine Tool Co., Cincinnati.
U. Baird Machinery Co., Pittsburg, Pa.

Plates—
Pittsburg Steel & Iron Mfg. Co., Pittsburg, Pa.

Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.

Portable Drills—
C. H. Haeseler & Co., Philadelphia, Pa.

Power Presses—
Springfield Machine Tool Co., Springfield, O.

Portable Forges—
Buffalo Forge Co., Buffalo, N. Y.
Cady Mfg. Co., Cleveland, O.
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.

Presses—
Springfield Machine Tool Co., Springfield, O.
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
Link-Belt Machinery Co., Chicago, Ill.

Pulley Blocks—
Moore Mfg. & Foundry Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn.
Willis Shaw, 416 N. Y. Life Bldg., Chicago.

Pumps (Steam)—
W. G. & G. Greenfield, East Newark, N. J.
Battle Creek Steam Pump Co., Battle Creek, Mich.
Deming Co., Salem, O.
The Edward P. Allis Co., Milwaukee, Wis.
Willis Shaw, 416 N. Y. Life Bldg., Chicago.
Atwood & M'Caffrey, Pittsburg, Pa.
Henry R. Worthington, Brooklyn, N. Y.

Pump Regulators—
Valley Iron Works, Williamsport, Pa.

Pyrometers—
Edward Brown, Philadelphia, Pa.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Retort Coke Ovens—
Semet-Solvay Co., Syracuse, N. Y.

Rock Breakers—
American Hoist & Derrick Co., St. Paul, Minn.

Rock Drills—
Rand Drill Co., Chicago, Ill.

Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.
Totten & Hogg I. & S. F'dry Co., Pittsburg, Pa.

Rolling Mill Supplies—
Atwood & M'Caffrey, Pittsburg, Pa.

Rolls—
Samuel Tretheway & Co., Pittsburg, Pa.

Roofs—
Berlin Iron Bridge Co., East Berlin, Conn.
The Cincinnati Corrugating Co., Piqua, O.

Roofing Plates—
Morton Tin Plate Co., Cambridge, O.
The Cincinnati Corrugating Co., Piqua, O.

Rust Preventatives—
Otto Goetze, New York City.

Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.

Sand Blast Machines—
Ward & Nash, Chicago, Ill.

Saws—
Peter Gerlach & Co., Cleveland.

Schools—
International Correspondence Schools, Scranton, Pa.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.

Scrap Iron & Steel—
Klein & Cohn, Cincinnati, O.

Screws—
Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.

Second-Hand Machinery—
Prentiss Tool & Supply Co., Chicago, Ill.

Semi-Steel—
McDowell Steel Co., Chicago, Ill.

Shapers—
Springfield Machine Tool Co., Springfield, O.

Shafting—
Finished Steel Co., Youngstown, O.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Long & Allstatter Co., Hamilton, O.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Berger Bros., Philadelphia, Pa.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.

Smoke Consumers—
American Smokeless Furnace Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Special Machinery—
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.

Skylights—
Translucent Fabric Co., Quincy, Mass.

Stacks—
Wm. B. Scaife & Sons, Pittsburg, Pa.

Stamping and Punching—
Cady Mfg. Co., Cleveland, O.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O
Vulcan Iron Works Co., Toledo, O.
Vulcan Iron Works, Chicago, Ill.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.

Steel Castings—
Wm. Jessop & Sons, Ltd., New York, N. Y.
The Johnson Co., Johnstown, Pa.
Potter & Hollis Foundry Co., Chicago, Ill.
McDowell Steel Co., Chicago, Ill.

Steel Knives—
Samuel Tretheway & Co., Pittsburg, Pa.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.
Cambria Iron Co., Johnstown, Pa.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.

Steel Shafting—
Finished Steel Co., Youngstown, O.

Steel Tanks—
Wm. B. Scaife & Sons, Pittsburg, Pa.
Berlin Iron Bridge Co., East Berlin, Conn.

Stokers—
Playford Stoker Co., Cleveland, O.

Structural Engineers—
Berlin Iron Bridge Co., East Berlin, Conn.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
Central Iron & Steel Co., Brazil, Ind.

Tanks—
S. Freeman & Sons Mfg. Co., Racine, Wis.
Enterprise Boiler Co., Youngstown, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.

Tapping Machines—
Harvey Hubbell, Bridgeport, Conn.

Telephones—
Universal Telephone Co., Indianapolis, Ind.

Time Detector—
Nanz & Co., New York.

Tinning Machinery—
The Lloyd-Booth Co., Youngstown, O.

Tin Plate—
Morton Tin Plate Co., Cambridge, O.
Atlanta Steel & Tin Plate Co., Atlanta, Ind.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.

Torches—
Dangler Stove & Mfg. Co., Cleveland, O.

Tool Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.
C. H. Besly & Co., Chicago, Ill.

Tube Welding—
S. Fix Sons, Cleveland.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Ventilating Fans—
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

Watchman's Time Detector—
Nanz & Co., New York.

Welding Compound—
Cornelius S. Mitchill, New York City.
E. G. Newhall & Co., Detroit, Mich.

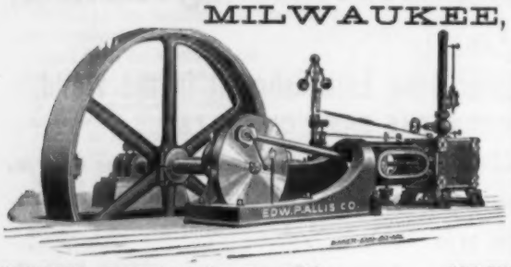
Wire Nails—
Salem Wire Nail Co., Salem, O.

Wire Rope—
American Hoist & Derrick Co., St.
Roberts Steel Chain Belting Co., Pittsburg

Wire Machinery—
Cady Mfg. Co., Cleveland, O.
John Adt & Son, New Haven Conn.

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

Blowing Engines, Hoisting Engines, Pumping Engines, Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills, Concentrators, General Mining, Milling and Smelting Machinery.

Reynolds Patent Vertical Boilers.

Reynolds Corliss Engines.

NEW YORK, Room 1111 Havemeyer Bldg.
CHICAGO, Room 509, Home Ins. Bldg
MINNEAPOLIS, Room 416, Corn Exchange.
DENVER, 1316 18th Street.

SAN FRANCISCO, 31 Main Street.
PITTSBURG, 702 German National Bank Bldg.
SALT LAKE CITY, Desert Bank Bldg.
KANSAS CITY, Armour Bldg.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Acme Mineral Nugget Co	21
Adt & Son, John	35
†Addyston Pipe & Steel Co	31
Ætna-Standard Iron & Steel Co	40
Aitchison, Rob't Perforated Metal Co	39
Allis & Co., Edward P	38
American Blower Co	22
American Fire Brick & Clay Co	20
American Hoist & Derrick Co	43
American Smokeless Furnace Co	20
Armstrong Bros. Tool Co	1
Atlanta Steel & Tin Plate Co	2
Atwood & M'Caffrey	33
Bacon, Earle C	22
Baird Machinery Co	21
Battle Creek Steam Pump Co	25
Berlin Iron Bridge Co	27
Besly & Co., C. H	44
Bethlehem Iron Co	43
*Berger Mfg. Co	31
*Bertsch & Co	31
Bickford, H	44
Bourne-Fuller Co	26
Brightman Furnace Co	22
Brown, Edward	34
Brown Hoisting & Conveying Machine Co	29
Bucyrus Steam Shovel & Dredge Co	28
Buffalo Forge Co	1
Cady Mfg. Co	39
Cambria Iron Co	41
Canadian Copper Co	1
Canton Leather Fillet Co	32
Central Iron & Steel Co	43
Chicago Heights Land Ass'n	29
†Chicago & Northwestern Ry	30
Channon & Co., H	44
Church, Isaac	43
Cincinnati Corrugating Co	2
Claflen Mfg. Co	25
Clearfield Fire Brick Co	43
Cleveland & Buffalo Transit Co	26
Cleveland City Forge & Iron Co	1
Cleveland Electrotype Co	34
*Cleveland Galvanizing Works	31
Cleveland Rolling Mill Co	43
*Clonbrook Steam Boiler Co	21
Coffman Coke Co., W. H	40
*C. M. & St. P. Ry	31
Cole, J. Wendell	44
Collins & Co., H. E	1
Craig Ridgway & Son	23
Dangler Stove & Mfg. Co	32
*Davis & Egan Machine Co	35
Deming Co	25
Detroit & Cleveland Steam Navigation Co	27
*Diamond Machine Co	—
Dickman & MacKenzie	2
Dixon, Jos. Crucible Co	39
Dover Fire Brick Co	43
Emmerton, F. A	2
Empire Boiler Cleaning Co	28
Enterprise Boiler Co	44
Franklin Electric Co	34
Finished Steel Co	22
*Fix Sons	34
Fleharty, J. H. & Co	34
Forster, Waterbury & Co	1
*Freeman & Sons, S	26
*Fulton Steam Boiler Wks. & Fdy. Co	26
Garden City Foundry Co	40
†Garden City Sand Co	20
Gerlach, Peter & Co	26
Gobeille Pattern Co	32
Goetze, Otto	2–20
*Greenfield, W. G. & G	26
*Haeseler & Co	31
Hamilton Foundry & Machine Co	1
Harrington & King Perforating Co	42
Harrison Safety Boiler Works	19
Hartford Steam Boiler Insp. & Ins. Co	25
Hazelton Boiler Co	26
Hooven, Owens & Rentschler Co	28
Hubbell, Harvey	44
Hunt & Co., Robert W	2
Illinois Central R. R	42
Illinois Screw Co	1
Indiana Bicycle Co	41
International Correspondence School	21
Iron Clad Paint Co	39
Jeffrey Mfg. Co	35
Jenkins Bros	40
Jessop & Sons, Ltd., Wm	35
Jones Foundry Co., W. A	1
Johnson Co., The	40
Junction Iron & Steel Co	2
Kellogg Weldless Tube Co	24
Kurtz & Buhrer Foundry Co	1
†Kelly & Co	33
Lambert Gas & Gasoline Engine Co	44
Link Belt Machinery Co	25
Lloyd Booth Co	42
*Lodge & Shipley Machine Tool Co	44
Marine Iron Works	22
Marion Steam Shovel Co	43
McDowell Steel Co	43
McEwen Mfg. Co	34
McNaull & Co	25
Michigan Mining School	34
Miller Gas Engine Co	21
Mitchill, Cornelius S	29
Monarch Cycle Mfg. Co	32
Morton Tin Plate Co	26
Moyes, L. M	24
Moore Mfg. & Foundry Co	1
*Nanz & Co	—
National Engraving Co	32
Newell Bros	1
Newhall & Co	34
Norman Co., J. J	32
North American Metaline Co	44
Oglebay, Norton & Co	26
Ohio Sand Co	44
Otto Gas Engine Co	39
Pittman, C. K	2
Pittsburg Steel & Iron Mfg. Co	32
Pollock, Wm. B. & Co	2
Playford Stoker Co	29
Pope, E. C	26
Potter & Holl's Foundry Co	21
Prentiss Tool & Supply Co	35
Q. & C. Co	44
Rand Drill Co	2
Reese, Hammond & Co	44
Roberts Steel Chain Be'ting Co	40
Rockwell & Co, W. S	27
Salem Wire Nail Co	42
Scaife & Sons, Wm. B	1
Semet-Solvay Co	35
‖Sharon Fire Brick Works	1
Sharpless & Winchell	44
†Shaw Electric Crane Co	30
Shiffler Bridge Co	41
Skinner Chuck Co	34
Southwark Foundry & Machine Co	26
Springfield Machine Tool Co	44
Standard Paint Co	43
Star Dynamo Co	39
Starrett Co	1
Sterling Emery Wheel Mfg. Co	42
Stirling Co	25
Stevens, F. B	33–44
Stilwell-Bierce & Smith-Vaile Co	2
Stowe, Fuller & Co	20
Stuart Fire Brick Co	41
Sturtevant Co., B. F	2–24
Sykes Iron Roofing Co	34
Taylor & Boggis Foundry Co	1
Textor, O	2
Thurman Fuel Oil Burner Co	22
Tod, Wm. & Co	42
Toledo Machine & Tool Co	43
Totten & Hogg I. & S. F'dry Co	25
Trethewey & Co	32
Translucent Fabric Co	27
Union Mining Co	20
United States Mailing Co	44
Universal Telephone Co	1
Upson Nut Co	1–22
Valley Iron Works	25
*Vulcan Iron Works, Toledo	28
Vulcan Iron Works, Chicago	27
Wickes Bros	2
†Ward & Nash	33
Westinghouse Electric & Mfg. Co	37
Westmoreland Fire Brick Co	39
Worthington, Henry R	32
Wright Co	35
Young, J. D	22

If you are thinking of enlarging your mill, foundry or machine shop, or of purchasing machinery of any kind, send us a line giving character of machinery needed. We can put you in communication with manufacturers from whom you can buy advantageously.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	$4.50@ 4.75
No. 1 Bessemer hematite	4.00@ 4.25
Hematites No. 1 non-Bessemer	2.25@ 2.75
No 1. Specular, non-Bessemer	2.75@ 3.25

PIG IRON.

CLEVELAND (f. o. b. cars):

Bessemer	$13 75@ 14 00
No. 1 Strong Foundry	12 75@ 13 00
No. 2 Strong Foundry	12 00@ 12 50
No. 1 Gray Forge, red short	11 75@ 12 00
No. 2 Gray Forge, neutral	11 25@ 11 50
No. 1 American Scotch	13 0.@ 13 25
No. 2 American Scotch	12 50@ 12 75
Lake Superior Charcoal	13 50

PITTSBURG:

No. 1 Foundry	$12 75@ 13 25
No. 2 Foundry	12 00@ 12 25
Gray Forge	11 25@ 11 50
White and Mottled	10 75@ 11 00
Warm Blast Charcoal	15 00@ 16 00
Cold Blast Charcoal	22 00
Bessemer	13 75

CHICAGO (reported by our representative:)

Lake Superior Charcoal	$13 50@$14 00
Local Coke Foundry No. 1	12 50@ 13 00
Local Coke Foundry No. 2	12 00@ 12 50
Local Coke Foundry No. 3	11 00@ 12 00
Local Scotch Foundry No. 1	12 50@ 13 00
Local Scotch Foundry No. 2	12 00@ 12 50
Local Scotch Foundry No. 3	11 25@ 12 00
Southern Coke No. 1	11 10@ 12 35
Southern Coke No. 2	11 60@ 11 85
Southern Coke No. 3	11 10@ 11 60
Southern No. 1 Soft	11 60@ 11 85
Southern No. 2 Soft	11 35@ 11 50
Southern Silveries No. 1	11 85@ 12 35
Southern Silveries No. 2	11 60@ 11 85
Jackson Co. Silveries	14 50@ 16 00
Ohio Silveries No. 1	15 00@ 15 50
Ohio Silveries No. 2	14 50@ 15 00
Ohio Strong Softeners	15 00@ 15 50
Alabama Car Wheel	16 85@ 17 35
Malleable Bessemer	13 50@ 14 00
Coke Bessemer	13 00@ 14 00

CINCINNATI (reported by Rogers, Brown & Co.)

Southern Coke No. 1, Foundry	$10 75@$11 25
Southern Coke No. 2 and No. 1 Soft	10 25@ 10 50
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	13 00@ 14 00
Jackson County Silvery No 1	14 00@ 14 50
Southern Coke, Gray Forge	9 25@ 9 50
" " Mottled	9 00@ 9 25
Standard Alabama Car Wheel	15 00@ 16 00
Tennessee " "	14 00@ 15 00
Lake Superior " "	14 50@ 15 00

BUFFALO:

No. 1 Foundry Strong Coke Iron Lake Superior Ore	$13 00@13 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	12 50@ 12 75
Ohio Strong Softener No. 1	13 00@ 13 50
Jackson Co. Silvery No. 1	15 25@ 15 50
Lake Superior Charcoal	13 50@ 14 00
Southern Soft No. 1	12 15
Hanging Rock Charcoal	17 00

ST. LOUIS (reported by Rogers, Brown & Meacham):

Southern Coke No 1	$ $11 50
Southern Coke No. 2	11 00
Southern Coke No. 3	10 50
Southern Gray Forge	10 00
Southern Charcoal No. 1	15 00
Missouri Charcoal No. 1	14 00@ 15 00
Ohio Softeners	16 00
Lake Superior Car Wheel	15 00
Southern Car Wheel	16 25

OLD RAILS AND SCRAP METAL.

	Gross Tons
Old iron rails	$16 25
Old steel rails	12 25
Old car wheels	13 00
	Net Tons
No. 1 R. R. wrought scrap	$12 75
Mill scrap	10 00
No. 1 Machine cast scrap	10 00
Iron axles	17 50
Axle turnings	9 00
Wrought turnings (free from cast)	8 00
Cast borings	7 00
Uncut wrought iron boilers	4 00
Steel boiler plates	10 00
Grate bars	6 75
Pipes and flues (clean)	10 00
Tank iron	10 00
Hoop and band iron	7 00
Sheet iron	6 50
Wrought drillings	7 50
Malleable iron	10 00

STRUCTURAL MATERIAL.

Beams and Channels (Cleveland mill)	1.54c
Angles	1.34c@1.39c
Tees	1.49c
Universal Plates	1.45c
Sheared Plates	1.50c

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 30
4¼ to 6 by ⅜ to 1 inch	1 35
1¾ to 6 by 1⅛ to 2 inch	1 35
1¾ & 1⅞ by ⅜ to ¾ inch	1 10
1 & 1⅛ by ⅜ to ¾ inch	1 20
⅛, ¼, ⅜, by ⅜ to ½ inch	1 0

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.
THE CADY MFG. CO.
18, 20 and 22 Johnson St., CLEVELAND, O.

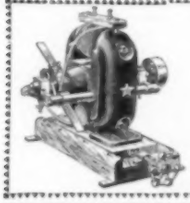
SEND FOR OUR NEW CATALOGUE OF Power Presses, Drop Hammers, Punches and Shears, Wire Working and Special Machinery.

PERFORATED METALS
OF ALL KINDS FOR
MILLING MINING AND AGRICULTURAL MACHINERY,
PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.
LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.
THE ROBERT AITCHISON. PERFORATED METAL CO.,
OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.

A. H. LEITCH, PREST. JOHN C. LEITCH, SEC. AND TREAS

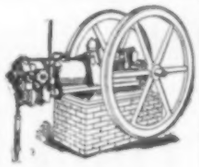
WESTMORELAND FIRE BRICK CO. MANUFACTURERS OF HIGH GRADE **FIRE BRICKS**
PITTSBURG, PA.
Works and Mines, Westmoreland, Pa.

DIXON'S GRAPHITE PAINT
FOR TIN OR SHINGLE ROOFS AND IRON WORK. IT IS ABSOLUTELY WITHOUT AN EQUAL. Tin roofs well painted have not required repainting for 10 to 15 years.
If you need any paint it will pay you to send for circular.
JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.



SMALL DYNAMOS
For Incandescent Lighting,
In Factories, Mills, etc., at a Reasonable Price.
If you have power put in your own lighting plant. Write for our Catalogue.
STAR DYNAMO CO., Jefferson City, Mo.

POWER From **GAS OR GASOLINE.**
No Steam, Coal, Ash, Gauges, Engineer nor Danger.
From 1 to 250 horse-power. } Can be Used in City or Country.
THE OTTO GAS ENGINE WORKS, Inc.
33d and Walnut Sts., PHILADELPHIA, PA.
S. M. York, 42 S. Water St., Cleveland Agent. Over 45,000 Sold.



IRON CLAD PAINT CO.
Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.
CLEVELAND OHIO.

ORDER DIRECT FROM THE
Iron Clad Paint Co.
And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.
IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.
FURNISHED both Dry and Ground in Oil
USED BY NEARLY ALL THE RAILROADS.

Round and Square.

1 to 1⅜ inch	1 10
2 to 2⅜ inch	1 30
2⅜ to 3¼ inch	1 25
3⅜ to 4 inch	1 60
4⅛ to 4⅜ inch	2 20
4⅜ to 5 inch	2 40

Oval.

⅜ to 1¼ inch	1 30
⅝ to ¾ inch	1 30
½	1 50
⅜	1 70

Half Oval and Half Round.

1¼ to 3 inch	1 65
⅞ to 1⅛ inch	1 45
⅝ to ¾ inch	1 70
⅜	1 85
⅜	2 90

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 20
1 to 1¾ by ¼ and 5-16 inch	1 25
¼ to ⅜ by ¼ and 5-16 inch	1 35
½ to ⅝ by ¼ and 5-16 inch	1 60

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 35
1 7-16 to 2, No. 17, 18 and 19	1 40
1 7-16 to 2, No. 20	1 50
1 7-16 to 2, No. 21	1 60
1 7-16 to 2, No. 22	1 70
1⅛ to 1⅜, No. 13, 14 and 15	1 70
1⅛ to 1⅜, No. 16, 17 and 18	1 40
1⅛ to 1⅜, No 19 and 20	1 45
1⅛ to 1⅜, No. 21	1 50
1⅛ to 1⅜, No. 22	1 60
15-16 and 1 inch, No. 13, 14 and 15	1 70
15-16 and 1 inch, No. 16, 17 and 18	1 35
15-16 and 1 inch, No. 19 and 20	1 50
15-16 and 1 inch, No. 21	1 60
15-16 and 1 inch, No. 22	1 70
⅞, No. 13, 14 and 15	1 80
⅞, No. 16, 17 and 18	1 60
⅞, No. 19 and 20	1 70
⅞, No. 21	1 80
⅞, No. 22	1 90
13-16, No. 13, 14 and 15	2 00
13-16, No. 16, 17 and 18	1 70
13-16, No. 19 and 20	1 80
13-16, No. 21	1 90
13-16, No. 22	2 00
¾, No. 13, 14 and 15	2 10
¾, No. 16, 17 and 18	1 80
¾, No. 19 and 20	1 95
¾, No. 21	2 05
¾, No. 22	2 15
11-16, No. 13, 14 and 15	2 25
11-16, No. 16, 17 and 18	2 05
11-16, No. 19 and 20	2 10
11-16, No. 21	2 20
11-16, No. 22	2 30
11-16, No. 23	2 40
⅝, No. 13, and 15	2 50
⅝, No. 16, 17 and 18	2 10
⅝, No. 19 and 20	2 20
⅝, No. 21	2 30
⅝, No. 22	2 40
⅝, No. 23	2 50
9-16, No. 13, 14 and 15	2 60
9-16, No. 16, 17 and 18	2 30
9-16, No. and 20	2 40
9-16, No. and	3 50
9-16, No. 221	1 60
9-16, No. 22	2 70
7-16 ad ½ inch, No. 13, 14 and 15	1 80
7-16 and ½ inch, No. 16, 17 and 18	3 50
7-16 and ½ inch, No. 19 and 20	2 60
7-16 and ½ inch, No. 21	2 70
7-16 and ½ inch, No. 22	2 80
7-16 and ½ inch, No. 23	2 90
½, No. 13, 14 and 15	3 00
½, No. 16, 17 and 18	3 00
½, No. 19 and 20	3 10
½, No. 21	3 20
½, No. 22	4 50
½, No. 23	3 60

Light Band.

1⅛ to 6 by ⅛ to 3-16 inch	3 75
1⅛ to 6 by Nos. 11 and 12	1 60
1 to 1¾ by ⅛ to 3-16 inch	1 65
1 to 1¾ by Nos. 11 and 12	1 65
⅞ and 13-16 by ⅛ to 3-16 inch	1 70
⅞ and 13-16 by Nos. 11 and 12	1 80
¾ and 11-16 by ⅛ to 3-16 inch	1 75
¾ and 11-16 by Nos. 11 and 12	1 90
⅝ and 9-16 by ⅛ to 3-16 inch	1 95
⅝ and 9-16 by Nos. 11 and 12	2 05
½ by ⅛ to 3-16 inch	2 10
½ by Nos. 11 and 12	2 20

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 25
⅞ inch, " " " " 13 and 14	1 50
¾ inch, " " " " 11 and 12	1 60
¾ inch, " " " " 13 and 14	1 65

Sheet Iron.

No. 10	1 75
No. 12	1 45
No. 14	1 55
No. 15-17	1 65
No. 18	1 75
No. 20	1 90
No. 22-24	2 05
No. 25 26	2 15
No. 27	2 25
	2 35

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 45
Shell	1 60
Flange	1 70
Marine Flange	2 00
Fire Box	2 50

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	08
9-16 to ⅞ in. "	08

ÆTNA-STANDARD IRON AND STEEL COMPANY,

BRIDGEPORT, OHIO,

MANUFACTURERS OF

TIN AND TERNE PLATE, Iron and Steel Plates and Sheets, Plain Black, Painted, Corrugated and other forms of ROOFING, SIDING and CEILING. Patent Leveled Galvanized Sheets, BARS, Light Section Rails, ANGLES, Tees, Channels, and other Miscellaneous Bars and SHAPES.

WITH SUCH DIVERSITY OF PRODUCT,

SPECIAL ADVANTAGES are offered buyers of mixed lots, effecting saving in freight charges and by reason of our LARGE STOCKS, securing **PROMPT SHIPMENT.**

INQUIRIES INVITED AND CATALOGUES MAILED ON APPLICATION.

ROBERTS STEEL CHAIN BELTING CO., Pittsburg, Pa.

Elevating and Conveying Machinery

For Handling all kinds of materials.

Special Wrought and Steel Chains of every description; Coil and Cable Chains; Chain Haulages for Coal Mines; Sprocket Wheels; Complete Coal and Ashes Handling Plants; Wire Rope Haulages and Wire Rope.

W. H. COFFMAN COKE CO.

BLUEFIELD, W. VA.

GENERAL FACTORS AND SHIPPERS OF

POCAHONTAS FLAT-TOP COKE.

So low in ash that it requires no fluxing for foundry purposes. Our foundry and furnace coke was awarded the first premium at the World's Fair in 1893.

AVERAGE ANALYSIS OF COKE.

Moisture	00.196	Sulphur	00.677
Fixed Carbon	93.625	Ash	05.004
Volatile Matter	00.494		

Foundry, Furnace and all sizes of crushed coke. Guaranteed lower in Sulphur than any other commercial coke

STEEL CASTINGS

FROM 10 LBS. UPWARD.

Made from Best Open-Hearth Steel.

ALSO SAND ROLLS AND CAST-IRON PINIONS.

SEND FOR ESTIMATES.

THE JOHNSON COMPANY, Johnstown, Pa.

GARDEN CITY FOUNDRY CO.

INCORPORATED.

Successors to TURNER, DICKINSON & CO.

Armitage and Central Avenues, Station G, Chicago, Ill.

FRICTION CLUTCHES, HANGERS, PILLOW BLOCKS & PULLEYS.

Large Stocks on Hand. Shipments Promptly Made.

We Claim The Following Merits for **Jenkins Bros.' Valves**

1. Manufactured of the best Steam Metal.
2. No regrinding, therefore not constantly wearing out the Seat of the Valves.
3. Contain JENKINS DISC, which is suitable for all Pressures of Steam, Oil and Acids.
4. The Easiest Repaired, and all parts Interchangeable.
5. Every Valve Tested before leaving the factory.
6. ALL GENUINE stamped with Trade Mark,

JENKINS BROTHERS, NEW YORK, PHILADELPHIA, CHICAGO, BOSTON.

7-16 to ⅜ and 2⅜ to 3 in.	.09
3⅜ to 4 in.	.09½
⅜ to 11-16 and 4⅜	.10
⅝ to 6 in.	.10½
⅝ to 9-32 and 6⅝ to 7 in.	.11
7 in	.13

Flats.

	cts. lbs
1 to 9-16 in. wide by 2 to ⅝ thick	6

Bessemer and O. H. Steel.

Bessemer Machinery	base price, 1 50
Open-hearth Tire	" 1 80
Open-hearth Spring	" 2 20
Sleigh Shoe	" 1 90
Toe Calk	" 2 10
Cutter Shoes, tapered and bent	" 2 20

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 30
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 00

Wrought Pipe and Boiler Tubes.

Lap weld black, base	dis. 65
Butt " " "	dis. [illegible]
Lap " galv. "	dis. 52½
Butt " " "	dis. 50
Boiler tubes 2¼" and smaller	dis 62½
Boiler tubes 2½" and larger	dis. 65
Casing screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis
Horton's Universal	dis
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis
" " Gear Cutters	dis

Crowbars.

Cast Steel	₩ lb 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

SHIFFLER BRIDGE COMPANY,

BUILDING DEPARTMENT.

SPECIALTIES: STEEL AND IRON BUILDINGS FOR ROLLING-MILLS TIN PLATE PLANTS, STEEL WORKS, FOUNDRIES, FACTORIES, ROOF TRUSSES, GIRDERS, COLUMNS, BEAMS, CORRUGATED IRON, ETC.

Main Office and Works:
48th Street and A. V. Ry.
PITTSBURG, PA.

Branch Offices:
1123 Betz Building, Philadelphia, Pa.
65 Dexter Building, Chicago, Ill.
228 Lumber Exchange, Minneapolis, Minn.

CAMBRIA STEEL.

Steel Rails, Blooms, Billets, Bars, Axles, Angles, Channels, Forgings, Locomotive Car and Structural Steel.

CAMBRIA IRON COMPANY, S. W. Cor. 15th and Market Sts., opp. Penna. R. R. Station, Philadelphia; Chicago office, Western Union Building; New York office, (for Rails and Axles), 33 Wall St.; Cleveland office, Bourne, Fuller & Co. Works at Johnstown, Pa.

GAUTIER STEEL DEPARTMENT OF CAMBRIA IRON CO.,

JOHNSTOWN, PA.

MERCHANT BAR STEEL: Including Tire, Toe Calk, Machinery, Carriage Spring, Railroad Spring, Hoe, Rake, Fork, etc.
AGRICULTURAL STEEL AND SHAPES: Finger Bars, Knife Backs, Rake Teeth, Bundle Carrier Teeth, Tedder Forks and Springs, Spring Harrow Teeth, Harrow (Drag) Teeth, Seat Springs, etc.
PLOW STEEL: Flat and Finished Plow Shapes, Digger Blades, Slabs (Penn and Perrot), Hammered Lay, Rolled Lay, etc.

Cold Rolled Steel Shafting. **Steel Harrow Discs.** **Cambria Link Barb Wire.**

New York Office, 102 Chambers St. | Philadelphia Office, 611 Phila. Bourse. | Chicago Office, 209 Western Union Bldg. | Atlanta Office, 325 Decatur st

STUART FIRE BRICK CO.

MANUFACTURERS OF
Silica Brick
For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER
Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

COMBINE SAFETY WATER TUBE BOILER

L. M. MOYES, MANUFACTURER, PHILADELPHIA, PA.

Waverley BICYCLES.

A POINTER TO DEALERS.

You have seen the words at the top of this ad. so often that they are engraved upon your mind. They are likewise engraved upon the mind of almost every individual who can read. When a person thinks of bicycles the first thing that flashes upon the mind is Waverley and that is the first wheel asked for. Do you realize the importance of being able to supply what a prospective buyer wants? Just consider it for a few moments, and then write us for terms.

INDIANA BICYCLE CO.,

INDIANAPOLIS, IND.
EASTERN DISTRIBUTING BRANCH.
339 BROADWAY, NEW YORK.

Emery.

	No. 4 to 46 gr.	No. 54 to 150 gr.	Flour, C. F. F. FF.
Kegs, 100 lb	4½c	5 c	2½c
½ kegs 50 lb	4¾c	5¼c	2¾c
¼ kegs 25 lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 50@50&5
H. H. Barton ..... dis 50@50&5

Emery Wheels.

Detroit ..... dis 60@70
Norton's ..... dis 60@70
Grant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 50
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@75
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs 12c
" " " " over 5 lbs 10c

Jack Screws.

Illinois Bolt Co. list ..... dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15½	11½	8½	6	5½	5½	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ¼ lb add ¼c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887 ..... dis 85
Standard Penny Nails, keg card rate
{ Car lots $2.25
{ Less than car lots $2.35

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 doz ..... dis 10@10&10

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 50
Medart Pulleys ..... dis 50
Split Wood Pulleys ..... dis 55@60

Pulley Blocks.

Moore's Anti-Friction Differential Chain Pulley Block ..... dis 20

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

New List, Apr. 9, 1894

Brass ..... dis 40
Copper ..... dis 40
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75&5
" " Nos. 27@36 ..... dis 75&10&5
Coppered Nos. 0 to 18, market list ..... dis 70@70&5
Galvanized Nos. 0 to 18 " " ..... dis 65&5
Tipped market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c 100 lb dis 30

Wrenches.

Coe's genuine ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanic's ..... dis 55&10&5
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 65
Billings & Spencer's Drop Forged ..... dis 25
William's " " ..... dis 25
Alligator " " ..... dis 40

Perforated Filter Press Plates.

THE HARRINGTON & KING PERFORATING CO. CHICAGO.

BRONZE SCREEN PLATES To withstand action of ACIDULATED WATERS.

PERFORATORS OF STEEL, IRON, COPPER, ZINC, BRASS AND TIN.

For use in GRAIN CLEANING AND MINING MACHINERY, WOOLEN, COTTON, PAPER AND PULP MILLS, RICE, FLOUR AND COTTON SEED OIL MILLS, SUGAR AND MALT HOUSES. DISTILLERIES, FILTER PRESSES. STONE, COAL, AND ORE SCREENS, BRICK AND TILE WORKS, FILTERS, SPARK ARRESTERS, GAS AND WATER WORKS, OIL, GAS AND VAPOR STOVES, COFFEE MACHINERY, ETC.

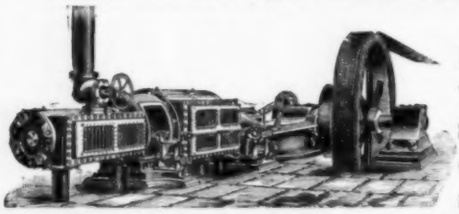
STANDARD SIZES PERFORATED TIN AND BRASS ALWAYS IN STOCK.

Main Office and Works, 222 to 240 No. Union St., Chicago, Ill., U. S. A. Eastern Office, No. 284 Pearl St., New York.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

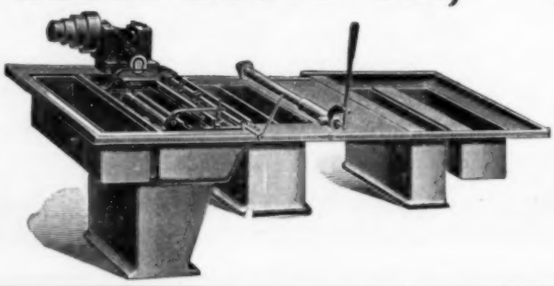
Williams Improved Vertical Engines

For Direct Electrical and all High Class Work.

39-41 Cortland St., N. Y. E. F. WILLIAMS. 1025 Monadnock B'ld'g, Chicago. ALBERT FISHER.

THE LLOYD-BOOTH CO., YOUNGSTOWN, OHIO.

Tinning MACHINERY.



Rolling Mills, Sand and Chill ROLLS.

ARE YOU LOOKING

FOR A CHANGE IN LOCATION?

If you are not satisfied with your present site, or if you are not doing quite as well as you would like to, why not consider the advantages of a location on the Illinois Central R. R. or the Yazoo & Mississippi Valley R. R.? These roads run through South Dakota, Minnesota, Iowa, Wisconsin, Illinois, Indiana, Kentucky, Tennessee Mississippi and Lousiana, and possess

FINE SITES FOR NEW MILLS,

BEST OF FREIGHT FACILITIES,

CLOSE PROXIMITY TO

COAL FIELDS AND DISTRIBUTING CENTERS

AND

INTELLIGENT HELP OF ALL KINDS,

MANY KINDS OF RAW MATERIAL.

For full information, write the undersigned for a copy of the pamphlet entitled

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This will give you the population, city and county debt, death rate, assessed valuation of property, tax rate, annual shipments, raw materials, industries desired, etc.

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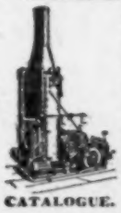

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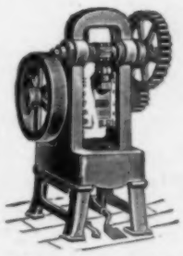

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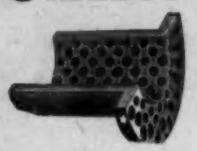

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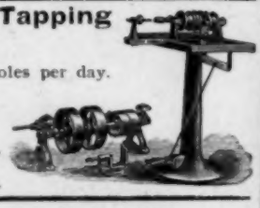

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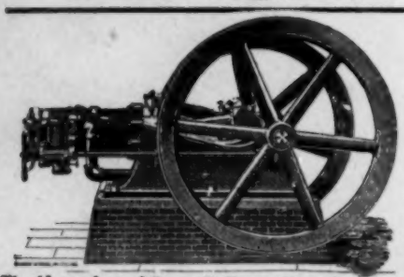

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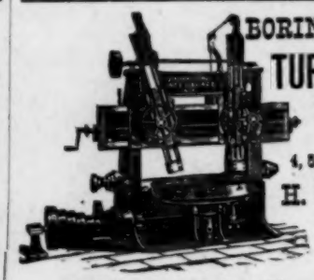

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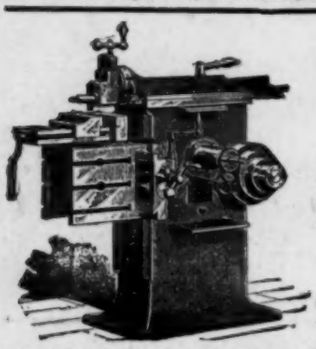

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